NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: Friday PM's
February 3, 1961

Release No. 61-16

NASA WILL LAUNCH IONOSPHERE BEACON SATELLITE (S-45)

More knowledge of the ionosphere is the goal of a forthcoming scientific experiment to be launched on a Juno II by NASA from Cape Canaveral.

Several universities in the United States and New Zealand are participating in this experiment, intending to find out more about the shape of the ionosphere -- where there are concentrations of electrons, where the ionosphere's profile has peaks or valleys in its structure.

So far, too little is known about the ionosphere, the ionized fringe area over the earth's atmosphere, from 50 to several hundred miles above the earth. Lack of this knowledge is costly in practical applications, such as long-range communications, which depend upon reliably bouncing signals off ionosphere layers.

The new payload being prepared for orbit is called the Ionosphere Beacon Satellite S-45. It looks very much like Explorer VII and Explorer VIII, two truncated cones back to back. The S-45, however, has a 6-foot loop antenna around its equator to transmit its low frequency signals to ground stations.

Unlike Explorer VIII, this 74-pound satellite will not be an experiment in itself. Explorer VIII carried instrumentation for direct measurements of the positive ion and electron concentrations in its orbital path around the earth. The new satellite will transmit on six frequencies (20 mc, 40 mc, 41 mc, 108 mc, 360mc and 960 mc). Ground stations receiving these signals will analyze them by various methods such as change in polarization or Doppler shift to determine characteristics of the ionosphere. The satellite is expected to orbit the earth every 115 minutes with an apogee of about 1,600 miles and a perigee of about 240 miles.

The Ionosphere

Until the beginning of space exploration, very little indeed was known about the ionosphere. Until the advent of radio broadcasting, a generation ago, no one had seriously investigated the ionosphere at all. Since measurements were necessarily made from the ground, much ionospheric theory developed before the age of rocketry has since proven to be erroneous.

United States rocketry has produced a tremendous amount of data about the ionosphere. Many miles of magnetic tape have been analyzed to date. This has resulted in findings that have led to better methods in ionospheric research. Yet the surface of space, so to speak, has scarcely been scratched. When the object is to map the whole ionosphere, its content from region to region about the earth, its profile for hundreds of miles into space, there must be a great deal of research.

Rocket measurements have revealed the cause of radio blackouts in high latitudes and crude means of predicting them have been devised. These flights have brought about an explanation for the inexactness of previous methods for predicting maximum usable frequencies for long-range communications circuits.

Rocket-gathered data have revealed serious errors made in the past in the interpretation of data obtained by ground stations. This has stimulated the development of more accurate analysis of these data by modern electronic computers.

Experiments must continue where unexplainable phenomena are revealed. A good example is a costly NASA tracking station at Lima, Peru, which is on a frequency of 108 megacycles. During much of the night-time this station cannot get accurate tracking data. At another station at East Grand Forks, Minn., signals vary greatly whenever satellites pass to the north after a severe disturbance on the sun.

There is so far no explanation for these phenomena. When there is one, it appears, it will be the result of scientific investigations.

New Zealand Experiment

One example of the benefits which may be expected from greater knowledge of the ionosphere relates to New Zealand. The two-island dominion is remote from Europe and America. Radio communications between these continents and New Zealand are vital, and unfortunately frequently beset with costly radio signal interference.

New Zealand's Seagrove Radio Research Station is one of the participants in the S-45 experiment. It is part of the Physics Department of the University of Auckland.

S-45 Program Participants

Others participating are: Pennsylvania State University, University Park, Pa.; University of Illinois, Urbana, Ill.; Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colo.; and Stanford University, Stanford, Calif.

A part-time observing site has been set up at Baker Lake, Canadian Northwest Territories by the University of Illinois. Stanford University has set up a station at the University of Hawaii. The Pennsylvania State University has established an equatorial recording station near the magnetic equator at Huancayo, Peru.

Coordination and data reduction is the responsibility of NASA's Goddard Space Flight Center. J. Carl Seddon is the Goddard manager. Tracking, after the initial "quick look," will also be a responsibility of Goddard through its world-wide Minitrack network.

The first "quick look" at data to determine whether the vehicle is performing well and whether the satellite is going into the desired orbit will be done by the NASA Marshall Space Flight Center.

The Marshall Center designed the payload, the first stage booster, and is responsible for the launch vehicle. Bill Greever is the Marshall manager.

The launch vehicle chosen for this experiment to be launched from Cape Canaveral is the Juno II, the 60-ton four-stage rocket used before in seven launch attempts, including the Pioneer III and Pioneer IV radiation space probes, the Explorer VII radiation satellite, and the Explorer VIII ionosphere satellite. Marshall designed the modified Jupiter first stage. The upper three stages were designed by the Jet Propulsion Laboratory.

If the S-45 goes successfully into orbit, it will be assigned an Explorer name and number to indicate that it has joined the other 33 United States satellites which have contributed much to the world's knowledge of the space environment.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

Release No. 61-16-2 HOLD UNTIL LAUNCH

FACTS ABOUT THE IONOSPHERE BEACON SATELLITE (S-45)

The S-45 satellite configuration is similar to those of Explorer VII and VIII. It is in the form of two truncated cones, the bases of which are attached to a cylindrical band, or equator. The satellite structure is 30 inches in diameter, identical in this respect to the earlier payloads; the height is 24 inches, six inches less than formerly.

The outer shell is constructed of aluminum. The fourth stage motor case, after burnout, will separate from the satellite.

The instrumentation consists of the following items:

1. Transmitter -- A single transmitter is usedto broadcast radio signals on six different frequencies at varying levels of power. This is the largest number of frequencies to be used by any satellite to date. The basic oscillator frequency is 1.00025 megacycles per second; the transmitting frequencies are six harmonics (multiples) of this basic crystal frequency, ranging from 20 to 960 megacycles. The radiated frequencies are as follows:

Harmonic	Frequency	Est. Transmitter Output	Est. Radiated Power
20	20.005 mc	300 mw	160 mw
40	40.010	100	40
41	41.01025	100	40
108	108.027	20	20
360	360.09	100	100
960	960.240	10	10

By measuring at ground receiving stations the change in polarization or the Doppler shift of the signals, it will be possible to determine the ionosphere electron content between the station and the satellite.

The six frequencies are developed from a 1.00025 mc. quartz crystal oscillator. These frequencies are made to be extremely stable by a unique heat filter surrounding the crystal which eliminates alternating changes in the crystal temperature as the satellite passes from sunlight into earth's shadow. The transmitter is also unique in that it employs high-efficiency capacity diode harmonic generators and transistor amplifiers to obtain an overall power efficiency of 35 percent.

2. Telemetry and Power Supply --

a. Telemetering will be done on the 108 frequency. A total of 14 channels of information will be transmitted. They are: temperature, 7 channels; satellite aspect, 2; voltage of exposed solar cells, 2; voltage of main power supply, 1; calibration, 2.

b. The power supply will consist of both solar cells and nickel cadmium batteries to operate the payload continuously up to about 13 months, when an automatic timer is scheduled to cut off the transmitter to make the frequencies available for other purposes. Four packs of rechargeable ni-cad batteries are located at 90 degrees apart on the equator of the satellite. The solar cell arrangement, on both the lower and upper cones of the payload, covers a total of 4665.6 square centimeters (2592 cells). The solar cells are covered individually with a sheet of silicon glass, .0006 of an inch thick, to protect them from radiation. Nominal output of the main power supply is 15.4 volts.

c. Two additional patches of identical unprotected solar cells are mounted on the center band of the satellite in two planes 45 degrees apart and 22.5 degrees respectively from the tangent plane of the satellite equator. The patches consist of 10 cells wired in series with a total patch output of 3-1/2 volts. As the satellite orbits, the reduction of the voltage output will indicate the extent of damage to the uncovered cells due to radiation. Placed at 45 degree angles to each other, the patches will also double as an aspect sensor when the voltages of the two patches are compared to the known value which results from the sun's striking the surfaces at a 90 degree angle.

d. Aspect Sensor -- While the exposed solar cell patches (above) serve as a backup or spare indicator of satellite aspect, the payload incorporates a specific aspect sensor, that is, an instrument to determine the satellite's orientation with respect to sources of light. The aspect system, located on the payload's equator, uses two photodiodes, one sensitive to the sun's rays and the other to the earth's albedo, or reflected light.

e. Temperature -- Seven temperature sensors are included in the payload, in the following locations: Two on protected solar cells, one on exposed solar cell, one in a battery pack, two in the transmitter, and one on the equator of the satellite. Thus, four external or skin measurements and three internal measurements are provided.

f. Antenna -- Two antennas are installed on the satellite, both of which were developed by the Marshall Center, and are being used for the first time. A loop antenna, six feet in diameter, extends from the satellite equator soon after the fourth stage rocket case is separated. It is held in place by centrifugal force. The loop antenna radiates the 20, 40 and 41 mc frequencies. The second is a spike antenna, 19-3/4 inches in length, which is mounted in front of the satellite along the spin axis. The 108, 360 and 960 mc signals are transmitted from it.

g. Payload Weight -- The weight of the payload is as follows:

Ionosphere beacon antenna assembly	2.7 pounds
Upper cone assembly	11.1
Lower cone assembly	10.2
Center ring	12.7
Shell assembly	6.1
Instrument column	16.4
Separation device	3.0
Battery packs (four)	6.5

Wiring		2.7
Fasteners		3.0
Balance weights		.6
	Total	75.0 pounds

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

Release No. 61-16-3

HOLD FOR LAUNCH

JUNO II FACT SHEET

1st Stage - Modified Jupiter. Booster section and propellant tanks extended three feet to gain 20 seconds burning time. Fuel - LOX and kerosene. Modification by Marshall SFC. Engine built by Rocketdyne Division of North American Aviation.

2nd Stage - Cluster of eleven solid propellant motors, fitted into spin tub mounted on first stage.

3rd Stage - Cluster of three solid rockets.

4th Stage - Single solid rocket. (Three upper stages originally developed by JPL for Jupiter C (Composite Reentry Test Vehicle) Built by Cooper Development Corp., Monrovia, Calif.)

Shroud - Over upper stages and payload.

Guidance - Stabilized platform in booster is "space-fixed" on target. Deviations from attitude sensed by sensors and altered by swivelling the rocket nozzle. Built by Ford Instrument Co.

Height of rocket - About 76 feet.

Weight - 60 tons at liftoff.

Speed (at burnout of first stage) - 11,000 miles per hour.

Total flight time (Liftoff to orbit) - About eight minutes.

Inclination - 50 degrees to the equator.

Apogee - About 1,600 miles.

Perigee - About 240 miles.

Period - About 116 minutes.

Flight procedure - First stage burns out in about three minutes. At burnout rocket is tilted into trajectory angle. Booster separates from instrument compartment in a few seconds by explosive bolts. Retrograde rockets slow first stage. Upper stages coast before shroud is ejected by explosive bolts and shunted aside by a kick rocket. Second stage ignites after five minutes. Third and fourth stages are fired in quick succession. Two minutes after fourth stage boosts payload velocity to desired level, the burned-out motor case is separated and the loop antenna is extended.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

Release No. 61-16-4 HOLD UNTIL LAUNCH

S-45 TRACKING AND DATA ACQUISITION

The Goddard Space Flight Center World-Wide Minitrack System is responsible for tracking the Ionosphere Beacon Satellite S-45, using the 108 mc beacon frequency during its active life-time of approximately thirteen months. Minitrack stations located at Woomera, Australia; Johannesburg, South Africa; Santiago, Chile; Antofagasta, Chile; Lima, Peru; Quito, Ecuador; Antigua, British West Indies; San Diego, California; Ft. Myers, Florida; and Blossom Point, Maryland will participate using interferometer tracking techniques. The Winkfield, England and East Grand Forks, Minnesota Minitrack stations will be used for telemetry acquisition purposes only.

During the launch and early orbit phases (defined as extending from lift-off, through power flight, and for the first three satellite orbits) additional "quick look" tracking data will be supplied by the Marshall Space Flight Center Doppler Station, Huntsville, Alabama; the ARGMA Doppler Station, Redstone Arsenal, Alabama; the Marshall Space Flight Center Doppler Station at Cape Canaveral, Florida; the Goddard Space Flight Center Minitrack Station at Cape Canaveral, Florida; the Goddard Space Flight Center portable Doppler stations at Atlantic, North Carolina; Paynters Hill, Bermuda; and Van Buren Maine; the Goddard Space Flight Center Minitrack Stations at Blossom Point, Maryland; Johannesburg, South Africa; and Woomera, Australia; the Ballistics Research Laboratories Doppler Station at Aberdeen, Maryland; the Fort Monmouth, New Jersey Doppler Station; the Jet Propulsion Laboratory Doppler Station at Camp Irwin, California; the Massachusetts Institute of Technology Lincoln Laboratories Millstone Hill Radar Station at Westford, Massachusetts, and the Jodrell Bank, England, radio telescope.

The "quick look" tracking data obtained by the above stations will be transmitted as soon as possible via electrical means to the Marshall Space Flight Center where it will be quickly evaluated and used in determining the Juno II vehicle performance, injection parameters, and initial orbital elements. The "quick look" data will also be transmitted to Goddard Space Flight Center where it will be used, along with the Minitrack Direction Cosine Data, to determine a more precise set of orbital elements and to compute predicted tracking and telemetry station acquisition times.

The satellite will transmit six frequencies which will allow experimenters all over the earth to pursue ionospheric studies by ground based observation of the satellite signals. The principal experimenters and their observing station locations are as listed below:

Mr. Fernandez de Mendonca
Radio Science Laboratory
Stanford University
Stanford, California

Dr. J. E. Titheridge
University of Auckland
Auckland, New Zealand

Mr. Robert S. Lawrence
National Bureau of Standards
Central Radio Propagation Laboratory
Boulder, Colorado

Dr. G. W. Swenson
Department of Electrical Engineering
University of Illinois
Urbana, Illinois

Dr. W. J. Ross
The Ionosphere Research Laboratory
Pennsylvania State University
University Park, Pennsylvania

The University of Illinois, Pennsylvania State University, and Stanford University also have substations which are located in Peru, Hawaii, and Canada.

It is the responsibility of each of the above experimenters to publish the results of his research in technical journals and/or scientific reports.

The 108 mc satellite beacon signal will be used for both tracking and for telemetering satellite aspect and environmental data. Telemetered data will be received by the Goddard Space Flight

Center Minitrack Stations and the Marshall Space Flight Center Station at Huntsville, Alabama. This data will be analyzed by both Goddard and Marshall and the results forwarded to the participating experimenters for use in their respective research.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

February 25, 1961
12:20 a.m. EST

NASA scientists said today all available evidence shows that it is highly improbable that the S-45 ionosphere beacon satellite achieved orbit. The satellite was launched by a Juno II vehicle from Cape Canaveral at 7:13 p.m. EST yesterday.

There was a malfunction shortly after booster separation. Because of a loss of radio transmission from the satellite, the sequence of events that followed could not be determined immediately. Since then no tracking station has acquired data that would indicate an orbit.

A study of available flight information is continuing.

- end -

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FOR RELEASE: February 24, 1961

RELEASE NO. 61-16-5A

7:15 p.m. EST

CAPE CANAVERAL, FLA. -- The United States today launched a 74-pound experiment designed to transmit information about the structure of the ionosphere.

Its four-stage Juno II booster was launched here at 7:13 p.m. EST.

The experiment is being conducted by the National Aeronautics and Space Administration.

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RELEASE NO. 61-16-5B

7:50 p.m. EST

CAPE CANAVERAL, FLA. -- Project officials are unable to confirm firing of the upper stages of the Juno II booster at this time. Tracking reports are being checked and further report on upper stage performance will be available shortly.

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RELEASE NO. 61-16-5C

10:25 p.m. EST

WASHINGTON, D. C. -- Telemetry indicates that a vehicle malfunction occurred shortly after first stage burnout. The payload did not achieve its planned orbit but there is some possibility that an orbit - undetermined at this time - was achieved. A final determination must await detailed analysis of data.

RELEASE NO. 61-16-5D

12:20 a.m. EST, Feb. 25, 1961

NASA scientists said today all available evidence shows that it is highly improbable that the S-45 ionosphere beacon satellite achieved orbit. The satellite was launched by a Juno II vehicle from Cape Canaveral at 7:13 p.m. EST yesterday.

There was a malfunction shortly after booster separation. Because of a loss of radio transmission from the satellite, the sequence of events that followed could not be determined immediately. Since then no tracking station has acquired data that would indicate an orbit.

A study of available flight information is continuing.

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FOR RELEASE: IMMEDIATE
February 3, 1961

RELEASE NO. 61-17

NASA TO NEGOTIATE SATURN BOOSTER TANK CONTRACT

NASA will negotiate with three firms on a contract to provide first stage 70-inch diameter tanks for five Saturn launch vehicles. The companies are Boeing Airplane Company, Seattle, Wash.; Chance-Vought Corp., Dallas, Tex.; and The Martin Company, Baltimore, Md.

The three were among 18 firms which submitted proposals for the approximate \$2¼ million contract.

Delivery will begin in mid-1962. The George C. Marshall Space Flight Center, Huntsville, Alabama will continue to assemble the 22-foot diameter S-1 stage which will produce 1.5 million pounds thrust.

Each stage contains nine tanks -- one 105-inch diameter liquid-oxygen tank centered in a cluster of eight 70-inch tanks, half containing RP-1 (kerosene) fuel and half containing liquid oxygen.

The contract will call for supplying the forty 70-inch tanks required for five boosters plus two spare tanks.

Final selection of the contractor will be made by Dr. Wernher von Braun, Director, Marshall Space Flight Center.

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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: IMMEDIATE
February 3, 1961

Release No. 61-18

NASA SELECTS INTEGRATION CONTRACTOR FOR NIMBUS METEOROLOGICAL SATELLITE

The National Aeronautics and Space Administration has selected General Electric, Missile and Space Vehicle Department of Philadelphia, Pa., for contract negotiations for construction of the spacecraft and integration of subsystems of the first two Nimbus meteorological satellites.

The contract will be approximately $4½ million. NASA's Goddard Space Flight Center, the installation having responsibility for scientific earth satellite programs, will negotiate and manage the contract.

The GE proposal was selected from six comprehensive integration and testing proposals submitted to the Goddard Center.

Nimbus is the second project in NASA's long-range research and development program to explore the problems and technology of a global weather analysis system. The first extensive meteorological satellite effort, Tiros, yielded more than 35,000 pictures of the earth's clouds and much new radiation data.

The Nimbus spacecraft will differ from Tiros in two aspects. First, it will be oriented so that the television cameras will look down at the earth at all times; and second, it will be launched into a polar orbit, permitting the cameras to photograph the entire globe in each 24-hour period.

A Thor-Agena B vehicle will launch the first Nimbus from the Pacific Missile Range during 1962 into a circular orbit about 600 miles above the earth.

The spacecraft, weighing approximately 650 pounds will contain as many as six television cameras to photograph the clouds covering the earth. These cameras are improved versions of the models flown in the Tiros satellites. Nimbus will also carry equipment for a number of infrared radiation measurements similar but also superior to those in Tiros II.

Two large paddles of solar-cells will convert the Sun's energy into electrical power to operate the satellite's instrumentation and supply power to storage batteries for continued operation during periods of darkness. Other basic parts of the spacecraft consist of tape recorders, telemetering and command equipment.

Nimbus will carry a thermostat to maintain its internal temperature at about ordinary room temperature at all times.

Cloud cover pictures and other data stored in the satellite will be played back by command from the primary data-acquisition site at Fairbanks, Alaska. All data obtained from Nimbus will be analyzed by meteorologists of the U. S. Weather Bureau and the defense establishment. Foreign scientists will also be invited to participate in the meteorological aspects of the program.

The Goddard Space Flight Center has awarded the following contracts for subsystems in the Nimbus spacecraft: RCA, Astro-Electronics Division, for all cameras and the solar power system; International Telephone & Telegraph Laboratories - infrared equipment; Santa Barbara Research Center - infrared equipment; Radiation, Inc. - telemetry system; California Computer - command system. General Electric MSVD will also be responsible for the control and stabilization system.

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NEWS RELEASE

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RELEASE NO. 61-19

FOR RELEASE: IMMEDIATE
February 8, 1961

SATURN BOOSTER TANK CONTRACT

NASA has selected a fourth company, the Chrysler Corp., Detroit, Michigan, for negotiations on a contract to provide first-stage 70-inch diameter tanks for five Saturn launch vehicles. NASA is also negotiating with Boeing Airplane Company, Chance Vought Corp., and The Martin Company, on the contract.

- END -

(See NASA release no. 61-17)

THE NASA COMMUNICATIONS SATELLITE PROGRAM

February 9, 1961

National Aeronautics and Space Administration

Washington 25, D. C.

THE NASA COMMUNICATIONS SATELLITE PROGRAM

For a period of two years NASA has been conducting a scientific research and development program of space exploration. Much valuable information has been obtained and several "firsts" have been accomplished. It is, of course, anticipated that the knowledge acquired from these investigations will result in tangible benefits to mankind. The earliest likely realization of such a benefit appears to be in the field of world-wide communications.

The use of artificial earth satellites to provide global communications represents the most promising solution for increasing our communications capabilities. The need for increased facility and more adequate and reliable communications has been expressed by both the governmental and commercial interests. During the past year, significant steps have been taken in the demonstration of feasibility and the development of communications satellites. The first passive communications satellite, ECHO I, was launched on August 12, 1960, and its feasibility demonstrated. On October 4, 1960, the U. S. Army's Courier satellite was successfully launched, demonstrating the feasibility of the delayed repeater active satellite concept. Both projects, successfully carried out, have sparked the enthusiasm of all concerned to proceed as rapidly as possible toward the ultimate goal of the establishment of operational communications satellite systems. There remains much research and development to be done as will be indicated, but none of the problems appear to be insoluble.

The NASA Communications Satellite Program has as its objective the rapid solution of these problems so that the characteristics of operational communications satellites can be established.

The specific NASA objectives in passive and active communications satellite research programs are included in the following:

Passive Communications Satellites

The ECHO I satellite experiment has demonstrated the technical capability of reflecting ground transmitted radio signals from a space-borne reflective surface to remote ground receiving stations. In a very short time following the successful launching of ECHO I a number of significant experiments were performed. On the first pass of the satellite (within two hours of launching) a previously recorded message by President Eisenhower was transmitted from the West Coast of the U. S. This was particularly significant because at that very time a solar disturbance caused interruption of high frequency, long distance communications. Following rapidly was the first two-way telephone conversation via a satellite, the transmission across the Atlantic Ocean to our friends in France and England, and the use of ECHO I for transmission of Facsimile pictures was demonstrated. On November 10, 1960, NASA assisted the U. S. Post Office Department in an experiment demonstrating the possible use of satellites in the transmission of Speed Mail.

Even though the ECHO I satellite was a non-rigid structure, it has shown that the inflated sphere concept can yield relatively long orbital life with the predictable orbital elements necessary to obtain accurate ground antenna pointing. The program effort has three major objectives for early solution: (1) the development of techniques for rigidizing the reflecting structures in space to increase its orbital life, (2) the development of techniques for placing more than one satellite into a predictable orbit from a single launch vehicle, and (3) the development of improved ground transmission and receiving equipment at higher microwave frequencies.

ECHO I experience, and the fact that the satellite is still in orbit rendering useful data although it is now somewhat distorted in shape, has indicated the follow-on passive satellite program. Since ECHO I did not collapse completely on the loss of its pressurization material, the thin film structure is almost structurally sound enough to sustain its shape in the space environment. It is believed that a nominal increase in resistance to buckling forces will provide the desired long-life structure.

Considerable knowledge of the space environment and the effect of the sun on satellites has been accumulated as a result of ECHO I. Because of its large size and small relative weight, ECHO I is extremely sensitive to the effects of atmospheric density and solar radiation pressure. The first real measurement was made of the atmospheric density at 1000 miles altitude and the theoretical forces exerted on satellites by solar radiation pressure were verified.

Another significant observation made was of the effect of solar flares on the drag forces acting on the satellite. During the solar disturbances of November 12 and December 5, 1960, an increase in the rate of change of the orbital period was observed indicating a probable increase by a factor of two in the atmospheric density at perigee.

This experience will contribute to the next phase of the passive satellite program which is already under way.

The satellite now under development will be a sphere approximately 140 feet in diameter, will weigh approximately 600 pounds, and will be constructed of a laminate of two layers of aluminum foil 1/4-thousandth of an inch thick on either side of a 1/3-thousandth inch thick sheet of Mylar. This construction will provide a resistance to buckling of a factor of 20 more than the ECHO I construction. This, coupled with a higher orbital altitude, where there are smaller air drag forces to contend with, should insure the life of the satellite.

The flight program calls for the testing of such a design in ballistic launches with Thor vehicles in the latter part of this year. Early in 1962 this rigidized sphere (Echo II) will be placed in a 700 nautical mile altitude orbit, using a Thor Agena B vehicle, to determine its life in the orbital environment. It is not intended that significant communications experiments be performed during this experiment because of the rather low altitude, but the satellite will be illuminated periodically by radars to monitor the shape and its quality as a radio-wave reflector.

Under Project Rebound, three satellites will be launched into a 1500 nautical mile orbit with an Atlas Agena B vehicle in late 1962 in the first test of a multiple launch spacecraft. This will be followed in approximately one year by a Centaur-launched spacecraft capable of placing 6 satellites in a 1500 nautical mile high orbit. It is intended that communications experiments be carried out during these phases of the program.

Because the large ground transmitter power requirement of passive satellite systems, it will be desirable to push the state-of-the-art of ground equipments as far as possible. With Project Rebound satellites in a 1500 nautical mile altitude orbit, a system with the following characteristics would yield 2 mc/s information bandwidth:

Antenna gain	60 db
Receiver system noise temperature	60 degrees K
Antenna pointing accuracy	.02 degrees
Transmitter power	40 - 50 Kilowatts
Frequency	6000 mc/s

Such systems can be achieved with today's technology.

The proposed experimental spherical satellites will carry 136 mc/s beacons for minitrack system orbital data acquisition, and 1700 mc/s beacons to assist in pointing the communications antennas during communications experiments.

Studies will be continued to determine the possibilities of passive satellites which provide some reflective gain. These generally require an attitude control system and NASA will investigate passive attitude control systems such as the gravity gradient system. When such techniques exhibit real possibilities, flight programs will be initiated.

Active Communications Satellites

The tremendous potential of active communications systems has been indicated by the success of the Courier satellite. This potential is further supported by recent industry advances in the development of communications system components. It is important that an active satellite communications system capable of providing a large bandwidth be demonstrated. The NASA approach will be to develop a relatively low altitude, long-lived, instantaneous repeater satellite. Necessary to the development of this satellite are the following: (1) the development of long-lived components, (2) the testing of components and systems in the space environment, (3) the development of required ground communications and tracking equipment, and (4) the launching of satellites which will contribute to the determination of our optimum operational system.

Various systems employing active satellites have been proposed, but they can be broadly separated into two categories. There is the 24-hour active satellite system. Satellites placed in this equatorial orbit, at an altitude of 22,300 miles, remain stationary with respect to a point on the earth's surface because the orbital period of the satellite is exactly 24 hours. Because of this unique orbital characteristic, as few as three satellites could provide global coverage (with the exception of the polar regions). Such a system has a further advantage in that antenna pointing problems on the ground are much reduced over lower altitude systems where the satellites continuously move relative to the ground stations. This approach is now under development by the DOD under Project Advent.

The satellite for the 24-hour system is comparatively complex. Not only must it carry the required active electronics and power supplies required for communications, but it must also carry a velocity control system to adjust the position of the satellite periodically so that it does indeed remain fixed with respect to the earth. Because of the satellite altitude, satellite antennas must be pointed continuously toward the earth to minimize the power required to communicate over this distance. This requires an attitude control system. Both the attitude and velocity control systems require that a supply of propellant be carried aboard the satellite. It is generally considered that these controls systems will limit the life expectancy and reliability of such satellites.

The time required for a radio-wave to travel over the 22,300 mile distance and back may cause objectionable delay in a two-way telephone conversation. (The time delay incurred in a single satellite circuit is approximately 0.6 second.)

The other category of active satellite systems can be referred to as low altitude systems (2000 to 6000 miles). Low altitude systems would necessarily consist of larger numbers of satellites, but they also remove the question of time delay and the requirements for complex attitude and velocity controls systems. Thus the satellites for such systems can be considerably smaller and lighter and, consequently, amenable to multiple-satellite launching (as discussed for passive satellites) making possible the placing of many in orbit with a single booster of the type required to place one satellite in the 24-hour orbit. The primary requirement of commercially operational communications satellite systems is long life and reliability. It is believed that the simpler low altitude active satellite can provide these desired characteristics of long life and reliability on a much earlier time scale than the more complicated 24-hour satellite system.

NASA has initiated a program of research and development of the low altitude active satellite. A contract study, already under way, has resulted in a determination of the desirable characteristics of a Phase I experimental satellite. These specifications have been released to industry. This first phase will be called Project Relay.

The exact configuration of the Project Relay satellite will be determined as a result of competitive proposal. The satellite will be composed of two basic subsystems: the active communications system; and a solar cell life test and an environmental radiation measurement system.

The entire satellite will weigh less than 100 pounds and will be placed in an elliptical orbit by the Thor Delta launching vehicle with apogee of 2500-3000 nautical miles and perigee of 600-1400 nautical miles.

The communications system to be carried on the Project Relay satellite will be powered by solar cells and storage batteries. All of the electronics (the receiver and transmitter) will be designed using solid state devices (i.e., transistors and diodes) with the exception of the final power output stage of the transmitter. This must necessarily be a vacuum tube today because there are no transistors capable of the power in the required frequency range, nor does it appear that any are on the developmental horizon. A travelling wave tube will be developed for this purpose. Travelling wave tubes show much promise toward supplying the required long life and wide band characteristics required for this application. With an omnidirectional antenna on the satellite, 85-foot aperture antennas and 150 degree Kelvin system noise temperatures on the ground, this satellite should provide for the transmission of a television bandwidth across the Atlantic Ocean. The exact frequency at which communications will take place has been left open to proposal, but it will be in the microwave region of the spectrum, at least for the satellite-to-earth link.

Of most concern to the development of low altitude active satellites is the life of the satellite, and therefore the effect of the space environment on the components of the satellite system. It is known that the radiation existent in the Van Allen belts and in other regions of space with solar disturbances can affect the life of solid state components. It is possible to shield against some of this radiation but not against others. It is therefore important that a radiation experiment be carried out in conjunction with Project Relay to: measure the effect of this radiation on various components of the communications system; measure the effect of this radiation on selected types of advanced solar cells with different levels of shielding; and to measure the amount of radiation experienced by the satellite during its life. Both the electron and proton densities will be measured to fully understand the effect of each type of particle.

Project Relay will therefore provide for the following:

1. The demonstration of feasibility of wide band communications via a low altitude active satellite.
2. Experience with the problems associated with pointing ground antennas at the satellite.
3. Experience in the orbital behaviour of such satellites and the ability to predict the position of the satellite for pointing ground antennas.
4. A satellite component test in the space environment.
5. A measurement of the radiation existent in this region of space and a simultaneous test of the effectiveness

of different degrees of shielding against this radiation.

Project Relay therefore provides an urgently needed first step toward accumulating the fundamental knowledge and experience required for the development of operational communications satellite systems.

The Flight Program schedules a first launch of a Project Relay satellite in mid-1962 on the Thor Delta vehicle. A second launch is scheduled. The timing of the second experiment will depend on the results of the first.

The second phase of the active satellite program will make use of the Atlas Agena B vehicles to provide more than a single, more advanced active satellite design in higher altitude orbits (perhaps 5000 to 6000 nautical miles).

It is intended that substantially the same ground facilities will serve both the active and passive satellite research programs. In the U. S. NASA will contract for the use of facilities and services of commercial companies. One of the facilities will be the AT&T proposed 60-foot x 60-foot aperture horn antenna. Its design goal of a 30 degree Kelvin system noise temperature will be entirely adequate for both the active and passive satellite programs. It would be most desirable to conduct trans-Atlantic experiments during these programs.

Several European communications interests have expressed a strong desire to cooperate in the research and development of communications satellite systems. It is NASA's policy to encourage such cooperative efforts. NASA will invite interested organizations in Europe and elsewhere to provide facilities such that a mutually beneficial program can be carried out. Such cooperation is essential to the early achievement of an operational global communications satellite network.

CONGRESSIONAL PRESENTATION

Communications Satellites

Leonard Jaffe, Chief
Communications Satellite Program

The use of artificial earth satellites to provide global communucations represents the most promising solution for increasing our communications capabilities. The need for increased facility and more adequate and reliable communications has been expressed by both the military and commercial interests. During the past year, significant steps have been taken in the demonstration of feasibility and the development of communications satellites. The first passive communications satellite, ECHO I, was launched on August 12, 1960, and its feasibility demonstrated. On October 4, 1960, the Army's Courier satellite was successfully launched demonstrating the feasibility of the delayed repeater, active satellite concept. Both projects, successfully carried out, have sparked the enthusiasm of all concerned to proceed as rapidly as possible with the research and development necessary to the establishment of operational communications satellite systems.

It is perhaps necessary to stress the need for research and development at this point. Much information is still required before the engineering of an operational prototype system can proceed. A more precise understanding of the space environment and its effect on satellite components is needed. A knowledge of how this environment (specifically radiation) varies with altitude is mandatory to the determination of an operational system. A better understanding of the orbital perturbing factors and how one generates orbital predictions is required. These and other problems associated with ground antenna pointing, as well as the development of reliable, long life, components, must be pursued before a real determination of which kind of system, active or passive, and the detailed engineering of an operational communications satellite system is possible.

In this presentation we will review briefly the accomplishments of Project Echo, the follow-on passive satellite research and development program, and finally NASA's program of research and development in the area of low altitude active repeater satellites.

Many of the problems, just mentioned, were brought to light with the first experiments in communication satellites, such as those of Project Echo.

Project Echo (Slide 1) was carried out under NASA and it is appropriate at this time to quickly review the program and its accomplishments. The objectives of Project Echo (Slide 2) were: to demonstrate the feasibility of using large inflatable spheres as communications reflectors; and to study the behavior of large, light-weight, erectable structures in the space environment. Project Echo was initiated early in 1959 and the following short film will review events leading to the successful launching of Echo I on August 12, 1960.

Film Narrative

Scene	Narrative
1. Title	Early in the program, the Langley Research Center was given the satellite development responsibility.
2. Cutting Material	Many industrial concerns contributed. The General Mills Corporation developed cutting processes for the DuPont Mylar from which the satellite is fabricated
3. Sealing seams	and the J. T. Schjeldahl Corp. developed a process for joining the pieces together.
4. Inflation in hangar	Every inch of the structure had to be inspected. For this purpose, the 100-foot diameter sphere was inflated in a huge hangar.
5. Container	For launching, this huge sphere had to be folded into a 26-inch diameter container.
6. Sifting in the sublimating powder 7. Folding	A sublimating powder was placed inside the satellite prior to folding. It is this material that would evaporate in space and inflate the 100-foot sphere.
8. Vacuum Chamber test	The satellite package design, and

ejection and inflation techniques were tested in 60 foot vacuum chambers at Langley Research Center but the final test had to be in the space environment itself. The satellite package was tested in vertical test flights from Wallops Island.

9. Vertical Test Firing

10. Beacon Fabrication

Following the first completely successful vertical test flight on April 1, 1960, a beacon transmitter was added to the satellite to assist in tracking. The beacon was developed by the RCA and consisted of a transmitter less than 1 inch square powered by tiny batteries and solar cells.

11. Goldstone Antenna Erection

12. BTL Horn Antenna Erection

Concurrently with the satellite development, a new powerful transmitter was being developed at NASA's Jet Propulsion Laboratory and at Bell Telephone Laboratory, Holmdel, New Jersey, a new type of receiving system got under way. The new horn type of antenna contributed very little noise to the systems, making possible the reception of very weak signals with newly developed maser amplifiers.

13.	Moon Bounce Experiment	These equipments, when completed, were checked out and exercised using the moon as a reflector of radio signals. New methods of antenna pointing and prediction of antenna pointing instructions had to be generated for the Echo experiment.
14.	Erection of Booster	The booster vehicle which was to launch Echo was the newly developed Delta three-stage rocket. The first attempt occurred on May 13, 1960, and a loss of attitude control in the second stage caused failure of the mission. On August 12, 1960, the second flight of the Delta was completely successful.

In a very short time following the successful Echo launching on August 12, a number of significant accomplishments were made. (Slide 3). On the first pass of the satellite (within two hours of launching) a previously recorded message by President Eisenhower was transmitted from the Jet Propulsion Laboratories at Goldstone, California to Bell Telephone Laboratories at Holmdel, New Jersey. This was particularly significant because at that very time a solar disturbance had blacked out high frequency long distance radio communications. Following in rapid succession, the first two-way telephone conversation was held between JPL and BTL and a signal was relayed via Echo I across the Atlantic to a station hear Paris, France. On August 22, voice and music were successfully transmitted across the Atlantic from Holmdel, New Jersey, to Jodrell Bank, England. On August 19, independent experimenters, the Collins Radio Company at Cedar Rapids, Iowa and their affiliate, the Alpha Corporation, in Richardson, Texas, transmitted the first Facsimile picture via Echo. Here (Slide 4) is the result of a subsequent facsimile experiment between NRL and BTL.

On November 10, NASA assisted the Post Office Department in an experiment to determine the possible use of satellites for the transmission of Speedmail. A copy of the letter received as a result of transmission via the Echo I satellite is shown here. (Slide 5).

Considerable knowledge of the space environment and the effect of the sun on satellites has been accumulated as a result of Echo I. Because of its large size and small relative weight, Echo I is extremely sensitive to the effects of atmospheric density and solar radiation pressure. The first real measurement was made of the atmospheric density at 1000 miles altitude and the theoretical forces exerted on satellites by solar radiation pressure were verified. Here (Slide 6) we see the history of the altitude of perigee of Echo I. Solar pressure caused the orbit to be displaced so that the perigee dropped from an initial 945 miles on August 12 to approximately 725 miles near the end of October. The circles indicate measured altitudes while the solid line is a theoretical curve. The deviation from theoretical in the latter phases probably indicates either a distortion of the spherical satellite or a change in the reflectivity of the surface due to wrinkling. As the attitude of the orbit changes with respect to the sun, solar radiation will begin to push the orbit back toward its original position with respect to the earth and the perigee altitude will increase.

Another significant observation was made of the effect of solar flares on atmospheric properties. On November 12 and December 5, severe solar disturbances occurred. A corresponding increase by a factor of two in the drag at the satellite altitude was observed, probably caused by a density increase.

The Echo I experiment has therefore resulted in the following: (Slide 7)

The feasibility of passive satellite systems has been demonstrated.

No deviations from radiowave propagation theory was observed and thus, the propagation theory was confirmed.

Orbital behavior theory has been confirmed.

Since the Echo I satellite did not collapse completely on the loss of its pressurization material the thin film structure is almost structurally sound enough to sustain its shape in the space environment. Echo I has and will continue to degrade its shape slowly, but its history has provided us with a confidence that large, erectable structures can be provided that will retain their shapes for long periods of time.

Echo I experience and the fact that the satellite is still in orbit rendering useful data although it is now distorted in shape, has dictated a continuation of the passive satellite program. The next phase is already under way. Here we have (Slide 8) the mission objectives of the program. The first step calls for the development and flight test of a larger, rigid spherical satellite which will exhibit long life. Because rather large numbers of satellites are required for operational systems, it will be economical to place more than a single satellite in orbit with the same booster vehicle. The second step, therefore, calls for the development and flight test of a multiple satellite launching from a single spacecraft.

Concurrently with the development of the satellites, the program calls for the development of the ground equipment necessary to demonstrate the wide band communications capabilities of the spherical satellites.

The satellite now under development is described here (Slide 9). The sphere, 140 feet in diameter, will weigh approximately 600 pounds, and will be constructed of a laminate of two layers of aluminum foil 1/4-thousandth of an inch thick on either side of a 1/3-thousandth inch thick sheet of Mylar. This construction will provide a resistance to buckling of a factor of 20 more than the Echo I construction. This rigidized sphere, coupled with the higher orbital altitude, where there are smaller air drag forces to contend with, represents a significant step toward providing a long lived, erectable, space structure.

Studies are now being initiated for the initial design of a multiple satellite launching spacecraft. Such a spacecraft would place a number of satellites in orbit with a single rocket booster and would reduce the costs of establishing a system involving many satellites. Such a multiple launching system may provide a uniform spacing between satellites in orbit. If uniform distribution can be accomplished and maintained for a length of time, the number of satellites required to provide continuous communications can be reduced considerably.

The Passive Satellite Flight program is indicated here (Slide 10). In late 1961, the 140-foot rigid sphere will be tested in ballistic launches using Thor vehicles. In early 1962, the rigid sphere will be placed in an 800-mile high orbit with a Thor Agena B vehicle to determine its life in the orbital environment.

Three satellites will be launched into a 1700 mile orbit with an Atlas Agena B vehicle in late 1962 in the first test of a multiple launch spacecraft. This will be followed in approximately one year by a Centaur-launched spacecraft capable of placing 6 satellites in a 1700-mile high orbit.

Scheduled also (Slide 11) is the development of a high powered vacuum tube, ground transmitter, and suitable low noise microwave antennas necessary for wide band communications in time for the first multiple sphere launch in late 1962.

There are a number of satellite systems which have been proposed for providing communications. All have their respective advantages and disadvantages and different problems to be solved in bringing about practical use of any one. We are in a period of research and development, and during this period it will be necessary to explore all of the approaches. We have just discussed the Passive Satellite Program. Passive satellites have the advantage of nothing within the satellite to fail and render it useless. Passive systems can also be used by any number of communicators at the same time as long as frequency allocations can be made available. Passive satellites have the disadvantage of requiring very large transmitters on the ground for wide band communications.

Let us turn now to the active repeater communications satellite. Active repeater satellites command considerable interest today. The active satellite (Slide 12) contains on-board electronics - a receiver to receive the signal transmitted to it from the earth, a transmitter which amplifies the signal before rebroadcasting it back to the earth, and the necessary power supply to operate the electronics. The sun's energy is converted to electricity by solar cells after which it is stored in batteries for use within the satellite. Since the active satellite does amplify the signal for its return trip to the earth, much smaller ground transmitters are required than in the case of the passive satellite where all power must originate on the ground. This fact makes the active repeater communications satellite appear most attractive today for commercial application.

Various systems employing active satellites have been proposed but they can be broadly separated into two categories. There is 24-hour active satellite system (Slide 13). Satellites placed in this 24-hour, synchronous orbit, at an altitude of 22,300 miles remain stationary with respect to a point on the earth's surface because the orbital period of the satellite is exactly 24 hours. Because of this unique orbital characteristic, as few as three satellites could provide global coverage (with the exception of the polar regions). Such a system has a further advantage in that antenna pointing problems on the ground are much reduced over lower altitude systems where the satellites continuously move relative to the ground stations. An approach to this type of system is now under development by the DOD under Project Advent.

The satellite for the 24-hour system is comparatively complex. Not only must it carry the required active electronics and power supplies required for communications, but it must also carry a velocity control system to adjust the position of the satellite periodically so that it does indeed remain fixed with respect to the earth. Because of the large distance from the earth, satellite antennas must be pointed continuously toward the earth to minimize the power required to communicate with over this distance. This requires an attitude control system. Both the attitude and velocity control systems require that a supply of propellant be carried aboard the satellite. It is generally considered that these controls systems will limit the life expectancy and reliability of such satellites.

The time required for a radiowave to travel over the 22,300 mile distance and back may cause objectionable delay in a two-way telephone conversation. (The time delay incurred in a single satellite circuit is approximately 0.6 second.) The characteristics of a 24-hour satellite are indicated in this slide.

The other category of active satellite systems can be referred to as low altitude systems (3000 to 6000 miles). Low altitude systems (Slide 14) would necessarily consist of larger numbers of satellites, but they also remove the question of time delay and the requirements for attitude and velocity controls systems. Thus the satellites for such systems can be considerably smaller and lighter and consequently amenable to multiple-satellite launching (as discussed for passive satellites) making possible the placing of many in orbit with a single booster of the type required to place one satellite in the 24-hour orbit. The primary requirement of commercially operational communications satellite systems is long life and reliability. It is believed that the simpler low altitude active satellite can provide these desired characteristics of long life and reliability on a much earlier time scale than the more complicated 24-hour satellite system.

NASA has initiated a program of research and development of the low altitude active satellite. A contract study, already under way with Space Technology Laboratories, has resulted in a determination of the desirable characteristics of a Phase I experimental satellite. These specifications have been released to industry. This first phase will be called Project Relay.

The exact configuration of the Project Relay satellite will be determined as a result of competitive proposal, but the basic characteristics are shown here (Slide 15). The satellite will be composed of two basic parts; the active communications electronics; and a solar cell life test plus environmental radiation measurement system.

The entire satellite will weigh less than 100 pounds and will be placed in a 600-mile to 2500-mile high elliptical orbit by the Thor Delta launching vehicle.

The communications system to be carried on the Project Relay satellite will be powered by solar cells and storage batteries. All of the electronics (the receiver and transmitter) will be designed using solid state devices (i.e., transistors and diodes) with the exception of the final power output stage of the transmitter. This must necessarily be a vacuum tube today because there are no transistors capable of the power in the required frequency range, nor does it appear that any are on the developmental horizon. A travelling wave tube will be developed for this purpose. Travelling wave tubes show much promise toward supplying the required long life and wide band characteristics required for this application. With an omni-directional antenna on the satellite (an antenna that radiates equally in all directions and not requiring pointing) and 85-ft. aperture antennas on the ground, this satellite should provide for the transmission of a television bandwidth across large distances along the earth. The exact frequency at which communications will take place has been left open to proposal, but it will be in the microwave region of the spectrum near the desirable area for operational systems.

Of most concern to the development of low altitude active satellites is the life of the satellite, and therefore the effect of the space environment on the components of the satellite system. It is known that the radiation existent in the Van Allen belts (Slide 16) and in other regions of space with solar disturbances can affect the life of solid state components. It is possible to shield against some of this radiation but not against others. It is therefore important that a radiation experiment be carried out in conjunction with Project Relay to: measure the effect of this radiation on various components of the communications system; measure the effect of this radiation on selected types of advanced solar cells with different levels of shielding; and to measure the amount of radiation experienced by the satellite during its life. Both the electron and proton densities must be measured to fully understand the effect of each type of particle.

Project Relay will therefore provide for the following (Slide 17):

1. The demonstration of feasibility of wide band communications via a low altitude active satellite.
2. Experience with the problems associated with pointing ground antennas at the satellite.
3. Experience in the orbital behaviour of such satellites and the ability to predict the position of the satellite for pointing ground antennas.

4. A satellite component test in the space environment.

5. A measurement of the radiation existent in this region of space and a simultaneous test of the effectiveness of different degrees of shielding against this radiation.

Project Relay will thus provide an urgently needed first step toward accumulating the fundamental knowledge and experience required in this program to develop a viable communications satellite system.

The Flight Program (Slide 18) schedules a first launch of a Project Relay satellite early in 1962 on the Thor Delta vehicle. A second launch is scheduled shortly thereafter, depending on the results of the first.

The second phase will make use of the Atlas Agena B vehicles to provide more than a single, more advanced active satellite design in an orbit 5000 to 6000 miles in altitude.

It is intended that substantially the same ground facilities will serve both the active and passive satellite research programs. NASA will also continue to encourage independent participation in these experiments as was done in

Project Echo to insure maximum utilization and return from each of the flight missions.

L. Jaffe

2-3-61

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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RELEASE NO. 61-20

FOR RELEASE: Monday AM's
February 13, 1961

NASA TO LAUNCH 12-FOOT SPHERE WITH ALL-SOLID SCOUT

The National Aeronautics and Space Administration is now making final plans that may place another satellite into orbit around the earth, but this time the civilian space agency will be using only solid fuels in the launch vehicle. In fact, the real purpose of this experiment will be to test the capability of the four-stage, all-solid propellant SCOUT launching vehicle.

Although SCOUT is still only mid-way through its developmental test series, this next NASA launch could result in two historical events. If everything goes as planned -- if all four stages fire properly and if the satellite achieves a successful orbit -- it will mark two "firsts" in space history:

1. It will be the first time that the United States has successfully placed a satellite into orbit using a rocket fueled entirely with solid propellants;

2. It will be the first time a satellite was launched from Wallops Island -- the first time the U.S. has orbited a satellite from a site other than Cape Canaveral or Pacific Missile Range.

While putting prime importance on the test of the SCOUT, the NASA will also be trying to get a better understanding of the density of the earth's atmosphere at different altitudes extending out to the edge of outer space.

How do you measure the density that far out? Several different methods have been used through the years. One method is to carry instruments aloft by means of balloons that can reach altitudes as high as 20 miles. Another method involves the use of sounding rocket techniques to measure the density to altitudes in excess of 100 miles. Information obtained from thousands of balloon flights before and after World War II and from hundreds of sounding rocket flights in recent years have generally confirmed the theoretical decrease in density as you go further out into the atmosphere. Furthermore, these flights have found that the density of the air envelope is also strongly influenced by the time of day, by the time of year, and by the latitude of the place where the measurements are made.

In recent years, particularly during the International Geophysical Year, greater knowledge of atmospheric density was gained by satellites of different shapes and sizes such as the Sputniks, Vanguard, Explorer, and Echo I. These satellites extended our knowledge of atmospheric density to nearly one thousand miles and further indicated that the density of the upper atmosphere is influenced markedly by solar storms.

The satellite planned in this test is a 15-pound Echo-type balloon made of mylar plastic and aluminum foil, 12 feet in diameter. As the balloon circles the earth in an elliptical orbit (apogee 1400 statute miles and perigee 400), it will continually lose energy as a result of the minute force (estimated to be less than one-thousandth of an ounce for this satellite) exerted on it by the earth's atmosphere. Because of the relatively light weight of the 12-foot balloon, this small drag force will result in measurable changes in the satellite's orbit. World-wide radio and optical tracking measurements of these changes in the orbit will give us information to determine this force which the atmosphere exerts on the satellite.

Because of the spherical shape of the satellite, this force will depend only on the atmospheric density and not on the attitude of the satellite. Therefore, more accurate values of density can be determined from these results than from results obtained from a satellite such as Explorer I in which the force depends on both density and satellite attitude.

It must be emphasized that the major concern will be centered around the performance of the four stages of this still-new solid propellant Scout vehicle.

The concern is understandable. SCOUT holds great promise for the future as a versatile and economical rocket vehicle. When it becomes fully reliable -- early in 1962 -- it will be able to do a number of useful jobs. In its present form it will be able to place 150 pounds into a 300-mile-altitude orbit above the earth. Vertical probes, with useful payloads, to an altitude as high as 8,000 miles will be possible.

SCOUT, like the military ballistic missiles MINUTEMAN and POLARIS, is fueled entirely by solid propellants. In fact, SCOUT is the only all-solid vehicle in the NASA inventory capable of launching a satellite. The launch vehicle people are "sold" on its future, and it is earmarked to become one of the four basic vehicles in NASA's goal to build up a fleet of standardized units for specific missions. SCOUT will then stand beside the Atlas Agena-B, Centaur, and powerful Saturn.

When SCOUT has successfully run through the developmental tests and is ready for operational use, it is destined to play a major role in future international space efforts. Sometime early in 1962, this versatile vehicle will be charged with the important role of carrying into earth orbit a scientific satellite designed and instrumented by scientists in Great Britain.

History of Scout Launches

The SCOUT has been under development by NASA for two and one-half years, has been tested three times since July 1960. The up-coming test will be the second time it has been tried in an orbital attempt.

This new launch vehicle performed satisfactorily on the first of its 8-shot developmental tests on July 1, 1960. On October 4 in a non-orbital probe shot mililar to the first test it performed perfectly. But when the 72-foot, four-stage rocket tried to orbit its first satellite on December 4, 1960, the day ended in disappointment with the failure of the circuit necessary to trigger the signal to ignite the second stage.

And now the launch vehicle stands ready for the next step --

the fourth checkout of all stages and the guidance-control systems.

There is nothing more that can be done but wait -- wait as the first stage Algol ignites and lifts the 36,600-pound research rocket off the ground, and then wait for the successive ignition of the three others -- Castor, Antares, and Altair. Finally after 622 grueling seconds the fourth stage is supposed to burn out. At this point, if all goes well, the fourth stage and the satellite will be put into orbit. This will occur at about 1,280 statute miles down range. A squib in the payload container will ignite and activate the inflation mechanism opening the inflation bottle valve and permit the inflation gas to flow from the bottle into the ejection bellows. The bellows will expand and push the folded satellite out of the front end of the payload container. When fully inflated, the sphere will be released and will push ahead of payload container and 4th stage by a separation spring. A beacon on the satellite will begin sending a signal to the ground tracking stations as soon as the satellite has been ejected from the payload container. This entire operation should take place in four and one-half minutes.

The fourth stage with the payload container is expected to become separated from the inflated sphere by an increasingly greater distance as they continue in orbit because of the differences in drag on the two objects. Since the sphere is a hundred times more sensitive to atmospheric drag than heavier satellites which have been launched, it is expected to remain in orbit from a few weeks to possibly a year before spiraling into the lower atmosphere and burning up. The predicted orbital lifetime of the relatively heavier spent rocket motor, which will also contain a tracking beacon, is much longer.

- END -

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

Release No. 61-20-1 HOLD UNTIL LAUNCH

SCOUT VEHICLE DEVELOPMENT FLIGHT
(AIR DENSITY-DRAG MEASUREMENTS EXPERIMENT)

National Aeronautics and Space Administration will launch the fourth in a series of Scout research rocket vehicles from Wallops Station, Wallops Island, Virginia, in an orbital flight which has two scientific purposes.

The principal aim is to study the performance, structural integrity and environmental conditions of the 72-foot, 36,600-pound four-stage Scout research vehicle and the guidance-controls system.

The second objective is to inject into orbit an inflatable 15-pound, 12-foot-diameter spherical satellite, fabricated of mylar plastic film and aluminum foil, for use in studying the characteristics of space -- primarily to measure air drag to determine the density of the earth's atmosphere on the fringe of space.

The present determination of atmospheric density at satellite altitudes is inferred from calculations of tracking data obtained from numerous satellites of different sizes and shapes. The air density-drag measurements experiment will provide accurate information on the characteristics of space between altitudes of about 400 down to 100 statute miles -- giving scientists a firm basis for more accurately predicting the orbital life of satellites and other vehicles.

In the air density-drag measurements experiment, the orbiting spherical satellite will be the measuring instrument. As the satellite, an object with a known mass and frontal area and highly sensitive to drag, begins to descend and dip more and more into the earth's atmosphere, it will lose energy. Worldwide radio and optical tracking measurements of the resultant changes in orbit will allow computations of atmospheric density.

The launch is part of NASA's Scout development program to provide the United States with a small, reliable and flexible solid-fuel booster capable of space probes and of orbital missions. The research rocket has been under development by the NASA Langley Research Center since mid-1958.

Payload Construction

Payload of the Scout vehicle weighs 80 pounds. This includes the 15-pound inflatable satellite and 65 pounds of satellite ejection and inflation equipment, the fourth stage telemeter system, and necessary hardware -- including the metal container in the nose of the Scout fourth stage. The fourth stage rocket motor and the attached payload container which will follow the sphere into orbit will weigh about 127 pounds.

About twice the thickness of the cellophane on a cigarette package, the satellite is constructed of four alternate layers of mylar plastic film and aluminum foil. The fabrication sequence is a layer of plastic film on the inside, an outer layer of aluminum foil, another layer of plastic film, and a final layer of aluminum foil on the exterior surface. Each layer is 0.0005 inches thick, resulting in a total laminated satellite thickness of approximately 0.002 or two mils. The sphere was fabricated at Langley by bonding together 40 flat gores of the aluminum-mylar laminate.

A 2¼-pound, 3 by 4-inch radio beacon attached to the satellite will be powered by 280 solar cells and miniature storage batteries. The storage batteries will supply the necessary power while the satellite is in darkness. The beacon's continuous wave crystal control transmitter will have a power output of about 15 mw and transmit on a frequency of 136.950 megacycles. This will be the first use of the Minitrack frequency of 136 megacycles in a satellite. Eight stations in the Minitrack network will track the satellite: Blossom Point, Md.; Quito, Equador; Ft. Myers, Fla.; Lima, Peru; Antofagasta, Chile; Santiago, Chile; Winkfield, England; and East Grand Forks, Minnesota.

The satellite aluminum foil is separated by a thin equatorial gap constructed of an insulating material -- permitting the resulting two foil-covered hemispheres to form the antenna for the tracking beacon transmitter.

Satellite Tracking

In gathering data for use in the drag measuring experiment, the tracking beacon in the satellite will be tracked by the Minitrack Receiving Station Network of the NASA Goddard Space Flight Center at

Greenbelt, Maryland. Optical tracking of the highly-reflective satellite will be accomplished by the Smithsonian Astrophysical Observatory (SAO) of Cambridge, Mass., through use of Baker-Nunn camera stations and cooperating optical tracking teams. SAO also plans to optically track the fourth stage.

Three Baker-Nunn camera stations are in the United States -- at Jupiter, Florida; Maui, Hawaii; and Oregon Pass, New Mexico. Those in foreign countries are located at Olifantsfontein, South Africa; Woomera, Australia; San Fernando, Spain; Tokyo, Japan; Naini Tal, India; Arequipa, Peru; Shiraz, Iran; Curacao, Netherlands West Indies; and Villa Dolores, Argentina.

Scientists at the Langley Research Center will analyze the satellite tracking data for the determination of the atmospheric density.

The deflated mylar-aluminum foil satellite is folded accordion-fashion and carefully packaged inside a metal tube $8\frac{1}{2}$ inches in diameter and about 19 inches long -- mounted on the front end of the fourth-stage rocket. The satellite and its attached tracking beacon components are inserted inside the front end of the tube to occupy a space approximately $8\frac{1}{2}$ inches in diameter and 11 inches long. Behind the folded satellite is an ejection bellows, a steel inflation bottle containing nitrogen gas under a pressure of about 1,800 pounds per square inch, followed by a fourth-stage telemeter and its batteries.

Orbital Data

The spherical satellite will be launched due east on an elliptical flight path. The perigee will be abour 400 statute miles and apogee about 1,400 statute miles. The belt covered by the initial orbits will extend 38 degrees north and south of the equator. The satellite is programmed to travel at a velocity of approximately 16,600 mph as it is injected into orbit and at perigee. Satellite speed at apogee will be about 14,000 mph. Time of the satellite's initial orbital period is estimated at 115.4 minutes.

The first orbit will carry the sphere across the southern part of Africa and mid-Australia, as it begins its first pass over the United States on the initial orbit near San Francisco. It will cross the lower half of the country before passing over the east coast and the Atlantic Ocean above Charleston, South Carolina. During twilight and evening the sphere, when overhead, will be visible to the naked eye at perigee but will be only barely visible at apogee without the use of binoculars or telescopes.

Sequence of Events

After launch, Scout's first stage remains attached to the vehicle until it is blasted off at second stage ignition at 130,000 feet. The burned out second stage coasts with the vehicle to about 310,000 feet and is blast-separated as the guidance programmer ignites the third stage rocket motor and the drag and heat fairings on the third and fourth stages are jettisoned. The spent third stage, with its guidance and control system operating, coasts to the injection altitude attached to the fourth stage. The fourth stage is then spun to about 150 rpm by small spin rockets, ignited, and separated from the third stage. The velocity increment gained during fourth stage burning places the payload and fourth stage into orbit.

Injection into orbit is scheduled to occur about $10\frac{1}{2}$ minutes after liftoff -- about 1,280 statute miles down range approximately at $52\frac{1}{2}$ degrees west longitude and 35.2 degrees north latitude. A squib in the payload container is ignited and activates the inflation mechanism -- opening the inflation bottle valve and permitting the inflation gas to flow into the ejection bellows. The bellows expand immediately and push the folded satellite out of the front end of the container. The satellite remains attached to the bellows by a disconnect mechanism during the inflation process. After it is fully inflated, the sphere is released by the disconnect mechanism and a separation spring pushes the satellite ahead of the combination payload container-fourth stage. The small tracking beacon becomes operative for the first time automatically upon the satellite's ejection from the payload container. It requires $4\frac{1}{2}$ minutes to eject, inflate and separate the satellite from the rocket.

The combination fourth stage rocket motor-payload container and the inflated sphere are expected to become increasingly separated in orbit because of differences in drag. Since the sphere is hundreds of times more sensitive to atmospheric drag than the heavier satellites which have been launched, it is expected to remain in orbit from a few weeks to possibly a year before spiraling into the lower atmosphere and burning up. The predicted orbital lifetime of the spent rocket motor is much longer.

A small tracking beacon will be placed in the fourth stage to facilitate its tracking by the Minitrack stations.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

Release No. 61-20-2 HOLD UNTIL LAUNCH

AIR DENSITY-DRAG MEASUREMENTS SATELLITE (S-56) -
SEQUENCE OF EVENTS

TIME (SECONDS)			EVENTS
0.0			First stage ignition
42			First stage burnout
70	1 min.;	10 secs.	Second stage ignition, first stage separation
111			Second stage burnout
116	1 min.;	56 secs.	Third stage ignition, second stage separation, fairings separation
156	2 min.;	36 secs.	Third stage burnout
579	9 mins.;	39 secs.	Fourth stage spin-up
581			Fourth stage ignition, third stage separation
622	10 mins.;	22 secs.	Fourth stage burnout, ignition of payload activation squitch, INJECTION INTO ORBIT
628			Activation of inflation bottle
629			Ejection of satellite from payload container and start of satellite inflation
899	15 mins.		Completion of satellite inflation and disconnection of satellite from payload container

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

RELEASE NO. 61-20-3

SCOUT RESEARCH VEHICLE

The Scout concept originated in mid-1958 at the Langley Research Center-- in the Applied Materials and Physics Division. This division has conducted hundreds of aeronautical and space research programs at Wallops Island, using solid fueled research vehicles having from one to six rocket stages. A special Scout Project Group, including several veterans of Wallops Island research launchings, was formed at Langley to develop the vehicle.

Scout is presently in its development phase. As an operational vehicle, it is designed to place a 150-pound satellite into a circular orbit approximately 300 miles above the earth or to loft a 50-pound scientific probe to an altitude of about 8,400 miles. In reentry body tests, Scout will permit simulation of conditions expected by a space vehicle returning to the earth's atmosphere. With a ballistic trajectory, it will be possible to obtain almost two hours of zero-gravity environment with 100-pound experiments.

Contractors and vendors in the program are:

Vought Astronautics Division of Chance Vought Aircraft, Dallas, Texas - launch tower fabrication and installation, airframe and motor transition section manufacturer.

Allegany Ballistics Laboratory, a Navy Bureau of Weapons facility operated by Hercules Powder Company at Cumberland, Maryland - third and fourth stage motor developments.

Aerojet-General Division of General Tire and Rubber Company, Sacramento, California - first stage motor development.

Redstone Division of Thiokol Chemical Corporation, Huntsville, Alabama - second stage motor development.

Aeronautical Division of Minneapolis Regulator Company, Minneapolis, Minnesota - guidance and controls (Hydrogen-peroxide controls were sub-contracted to Walter Kidde, Clifton, New Jersey).

The following is a description of the four Scout rocket stages and the vehicle's auxiliary parts:

First Stage: Algol, 30 feet long, 40 inches in diameter, and developing 103,000 pounds of thrust, is fin-stabilized and controlled in flight by jet vanes. The largest solid rocket flown in the United States, its sole operational application to date is as the Scout first stage. Algol is named for a fixed star in the constellation Perseus.

Second Stage: Castor is 20 feet long, 30 inches in diameter and has a thrust of over 62,000 pounds. A modification of the Sergeant motor, it has been used successfully in a cluster in NASA's Little Joe program in support of Project Mercury. On the Scout, the Castor is stabilized and controlled by hydrogen-peroxide jets. Castor is the "tamer of the horses" in the constellation Gemini.

Third Stage: Antares is 10 feet long and 30 inches in diameter with a thrust in excess of 13,600 pounds. Stabilized and controlled by hydrogen-peroxide jets and utilizing lightweight plastic construction throughout its design, Antares is a scaled-up version of the fourth stage and is the only motor developed specifically for Scout. Antares is the brightest star in the constellation Scorpio.

Fourth Stage: Altair, six feet long, 18 inches in diameter, and having 2,800 pounds of thrust, is the smallest of the four Scout stages. The spin-stabilized Altair formerly was known as X-248. It is the third stage on the Able and Delta launch vehicles and was the first fully developed rocket to utilize lightweight plastic construction throughout. Altair is a star of the first magnitude in the constellation Aquilae, or Eagle.

Auxiliary Parts: The added Scout airframe parts consist of control surfaces surrounding the nozzle of the first stage, transition sections connecting the four rocket stages, a fibreglass-phenolic protective heat shield which covers the third and fourth stages plus payload, the fourth-stage spin-up table, and the payload attachment structure.

- END -

Exp. IX

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D. C.

RELEASE NO. 61-20-6

IMMEDIATE RELEASE
February 16, 1961

WASHINGTON, D. C. -- Preliminary orbital elements of the fourth stage casing of the Scout rocket launched at 8:05 a.m. EST today were announced tonight by NASA. They are:

Perigee - 410 statute miles

Apogee - 1610 statute miles

Period - 118-3/4 minutes

Inclination - 38°

These elements are based on signals acquired during the day by NASA minitrack stations from the tracking beacon on the burned out fourth stage rocket casing.

NASA scientists were pleased with the performance of the Scout -- in its second orbital try -- which appeared to be **almost** as programmed.

On the basis of the orbital elements for the fourth stage, NASA scientists said that it is probable that the 12-foot sphere achieved orbit. Since no beacon signals have been received from the sphere itself since 9:20 a.m. EST today at the Woomera minitrack station, there apparently is a malfunction in the payload.

NASA minitrack stations are continuing to track the rocket casing by its tracking beacon. The Smithsonian Astrophysical Observatory's optical tracking network is attempting to confirm that the payload is in orbit.

RELEASE NO. 61-22

For Release: IMMEDIATE
February 10, 1961

US-Australian Voice Transmission Via the Moon

The United States and Australia today joined in a space communication experiment that sent a voice message of good will from Washington to Woomera, Australia by way of the Moon.

Dr. High L. Dryden, Deputy Administrator of NASA talked by telephone from his office with the Honorable Alan Hulme, Minister for Supply, who was at NASA's tracking facility located at Woomera, Australia. Dr. Dryden's message was transmitted by telephone line to Goldstone, California, where NASA's tracking station "bounced" it to Australia via the Moon.

Dr. Dryden's message to Mr. Hulme was: "I would like to take this opportunity to send greetings through the Deep Space Instrumentation Station at Woomera, Australia." Warm greetings especially to our colleagues of the Australiam Department of Supply, which generously has undertaken the operation of this new station, soon to track and retrieve data from spacecraft in the far reaches of the solar system. It is my hope that this moon-bounced message, and the cooperative research which follows, will illustrate to all that man's technological progress can serve to bring men everywhere closer together."

Mr. Hulme, in replying to Dr. Dryden said: "Australia is very pleased indeed to be associated with the United States in this extensive and exciting program. I feel this is a good example of the truly international nature of science at its best. I also would like to take this opportunity to tell you that, in addition to their professional qualification, your countrymen, who have been working with us in the installation of this equipment, have been fine ambassadors for the United States."

The tracking stations at Goldstone and Woomera are part of NASA's Deep Space Instrumentation Facility which is under the technical direction of the California Institute of Technology Jet Propulsion Laboratory, Pasadena, Calif.

Febry 14, 1961 Advanced version of the Navy Bull-Pup missile, solid propellant airborne missile capable of carrying a nuclear warhead, launched from two F-100 aircraft for the first time at Eglin AFB

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RELEASE NO. 61-23

For Immediate Release
February 13, 1961

STATEMENT BY NASA

U. S. tracking agencies have been tracking the latest Russian satellite which was launched Sunday and are seeking to track the probe which was launched from the satellite toward the planet Venus.

According to Russian announcements, the Venus probe is on a command frequency. The probe transmitter is activated by direction of USSR tracking stations at various intervals and can only be tracked when transmitting.

NEWS RELEASE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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RELEASE NO. 61-24

FOR RELEASE: IMMEDIATE
February 14, 1961

NASA ANNOUNCES HEAT TRANSFER CONTRACT

General Electric's Flight Propulsion Laboratory Department of Cincinnati, O., has been chosen for negotiation of a contract to study heat flow characteristics of several working fluids which may be used in spacecraft nuclear power plants.

The General Electric laboratory would share the cost of the estimated $575,000 project with the NASA. The study should take about 18 months, NASA said.

Sodium and potassium are being considered for use as working fluids in high power systems for nuclear electric power which are under study as a means of electrically propelling large payloads over interplanetary distances and to provide power for spacecraft experiments.

These electric systems are designed to use liquid metals such as sodium and potassium which are boiled to a vapor by the heat of a nuclear reactor. Electricity is generated from the hot vaporized metal by passing the vapor through a turboelectric generator. Then the vapor is recycled back to fluid in the closed system. Waste heat would be radiated into space by a condenser-radiator device.

\- END -

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

NASA Release No. 61-25 February 15, 1961

NOTE TO EDITORS:

Attached are International Space Activity Summary charts for all launches conducted during 1957-58. This will complete the series through 1960. The series to date consists of the following:

CODE NO.	PROJECT	LAUNCH DATE
	1957-58	
F-57-1	*Sputnik I	October 4, 1957
F-57-2	*Sputnik II	November 3, 1957
S-57-1	Vanguard	December 6, 1957
S-58-1	*Explorer I	January 31, 1958
S-58-2	Vanguard	February 5, 1958
S-58-3	Explorer II	March 5, 1958
S-58-4	*Vanguard I	March 17, 1958
S-58-5	*Explorer III	March 26, 1958
S-58-6	Vanguard	April 28, 1958
F-58-1	*Sputnik III	May 15, 1958
S-58-7	Vanguard	May 27, 1958
S-58-8	Vanguard	June 26, 1958
S-58-9	*Explorer IV	July 26, 1958
P-58-1	Lunar Probe	August 17, 1958
S-58-10	Explorer V	August 24, 1958
S-58-11	Vanguard	September 26, 1958
P-58-2	Pioneer I	October 11, 1958
S-58-12	Beacon	October 23, 1958
P-58-3	Pioneer II	November 8, 1958
P-58-4	Pioneer III	December 6, 1958
S-58-13	*Project Score	December 18, 1958
		Total 1957-58: 21
	1959	
F-59-1	*Lunik I	January 2, 1959
S-59-1	*Vanguard II	February 17, 1959
S-59-2	*Discoverer I	February 28, 1959
P-59-1	*Pioneer IV	March 3, 1959
S-59-3	*Discoverer II	April 13, 1959
S-59-4	Vanguard	April 13, 1959
S-59-5	Discoverer III	June 3, 1959
S-59-6	Vanguard	June 22, 1959
S-59-7	Discoverer IV	June 25, 1959
S-59-8	Explorer	July 16, 1959
S-59-9	*Explorer VI	August 7, 1959
S-59-10	*Discoverer V	August 13, 1959
S-59-11	Beacon	August 14, 1959

S-59-12	*Discoverer VI	August 19, 1959
F-59-2	*Lunik II	September 12, 1959
S-59-13	Transit I-A	September 17, 1959
S-59-14	*Vanguard III	September 18, 1959
F-59-3	*Lunik III	October 4, 1959
S-59-15	*Explorer VII	October 13, 1959
S-59-16	*Discoverer VII	November 7, 1959
S-59-17	*Discoverer VIII	November 20, 1959
P-59-2	Pioneer	November 26, 1959

Total 1959: 22

1960

S-60-1	Discoverer IX	February 4, 1960
S-60-2	Discoverer X	February 19, 1960
S-60-3	Midas I	February 26, 1960
P-60-1A	*Pioneer V	March 11, 1960
S-60-4	Explorer	March 23, 1960
S-60-5A	*Tiros I	April 1, 1960
S-60-6A	*Transit I-B	April 13, 1960
S-60-7	*Discoverer XI	April 15, 1960
S-60-8	Echo	May 13, 1960
F-60-1	*Spacecraft I	May 15, 1960
S-60-9	*Midas II	May 24, 1960
S-60-10	**Transit II-A	June 22, 1960
S-60-11	Discoverer XII	June 29, 1960
S-60-12	*Discoverer XIII	August 10, 1960
S-60-13	*Echo I	August 12, 1960
S-60-14	*Discoverer XIV	August 18, 1960
S-60-15	Courier I-A	August 18, 1960
F-60-2	*Spacecraft II	August 19, 1960
S-60-16	*Discoverer XV	September 13, 1960
P-60-2	Pioneer	September 25, 1960
S-60-17	*Courier I-B	October 4, 1960
S-60-18	Samos I	October 11, 1960
S-60-19	Discoverer XVI	October 26, 1960
S-60-20	*Explorer VIII	November 3, 1960
S-60-21	*Discoverer XVII	November 12, 1960
S-60-22	*Tiros II	November 23, 1960
S-60-23	Transit III-A	November 30, 1960
F-60-23	*Spacecraft III	December 1, 1960
S-60-24	Explorer	December 4, 1960
S-60-25A	*Discoverer XVIII	December 7, 1960
P-60-3	Pioneer	December 15, 1960
S-60-26	*Discoverer XIX	December 20, 1960

Total 1960: 32

* Indicates satellite achieved orbit.
** Two satellites placed in orbit.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
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FOR RELEASE: IMMEDIATE
February 14, 1961

RELEASE NO. 61-26

ORBITAL ELEMENTS OF SOVIET SATELLITES

1961 Beta 1, the 7-ton satellite launched on February 4, 1961, by the U.S.S.R. is being tracked by the United States. The most recently computed figures indicate the following orbital elements for this satellite:

Incl.	64.90°
Period	89.66 minutes
Apogee	196 statute miles
Perigee	125 statute miles

The rocket body, Beta 2, has reentered the atmosphere and burned up.

An object, Beta 3, believed to have been ejected or broken off from the 7-ton satellite, also is being tracked, but no precise orbital elements are available at this time.

We are attempting to track 1961 Gamma 1, the Russian probe launched from orbit toward the planet Venus on February 12, 1961.

1961 Gamma 2, the rocket body, is believed to have reentered the atmosphere.

The satellite from which the probe was launched has broken into two parts, 1961 Gamma 3 and 4. They are being tracked and the most recently computed figures indicate the following orbital elements:

1961 Gamma 3	Incl.	65.01° to Equator
	Period	89.79 minutes
	Apogee	201.5 statute miles
	Perigee	123 statute miles
1961 Gamma 4	Incl.	65.01° to Equator
	Period	89.54 minutes
	Apogee	186 statute miles
	Perigee	124 statute miles

Explorer IX

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: IMMEDIATE
February 16, 1961

Release No. 61-20-5

WASHINGTON, D. C. -- The United States today launched a 12-foot diameter sphere to determine atmospheric density at various altitudes above the surface of the earth.

The four-stage Scout rocket carrying the sphere was launched from Wallops Island, Virginia at 8:05 a.m. EST.

The experiment is being conducted by the National Aeronautics and Space Administration.

WASHINGTON, D. C. -- The second, third,and fourth stages of the Scout rocket vehicle, used to launch a 12-foot sphere for the measurement of atmospheric density, have been successfully fired, project officials said today at 8:16 a.m. EST. Further information on this experiment will be released by the National Aeronautics and Space Administration's Office of Public Information in Washington, D. C.

WASHINGTON, D. C. -- Scientists in charge of the experiment in which a 12-foot sphere was launched from Wallops Station, Va., at 8:05 a.m. EST today confirmed at 11:37 a.m. EST that the burned out fourth stage rocket casing has achieved orbit. This was based on acquisition of the tracking beacon on the casing on its second pass by the Johannesburg minitrack station at 10:53 a.m. EST.

Scientists could not confirm that the 12-foot sphere achieved orbit. At 8:42 a.m. EST the tracking beacon on the sphere itself was acquired by Johannesburg. At 9:20 a.m. EST, the Woomera minitrack station acquired a tracking signal but it has not been determined if it was from the sphere or the fourth stage casing.

All stations are continuing attempts to acquire the sphere or fourth stage casing.

Found in orbit

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

Release No. 61-20-4 HOLD UNTIL LAUNCH

INFLATABLE SPHERICAL SATELLITES

The 12-foot inflatable spherical satellite employed as a research vehicle by NASA was conceived, fabricated, and packaged at the Langley Research Center by a team of scientists, engineers, technicians, and skilled modelmakers. The material for the Scout satellite was laminated to NASA specifications by the Reynolds Metals Company.

The satellite was developed under direction of William J. O'Sullivan, Jr., head of Langley's Space Vehicles Group and a pioneer in the field of research with inflatable and erectable space structures. He directed the design, development, and packaging of the Echo I passive communications satellite which has been in orbit since last August 12.

O'Sullivan first proposed in January 1956 the use of lightweight spherical satellites in measuring the minute aerodynamic drag experienced by earth satellites in the outer fringes of the earth's atmosphere -- to obtain density data by observation of the orbit decay.

There have been four previous attempts to orbit small spherical satellites in air density-drag measurements experiments -- three from Cape Canaveral and one from the NASA Wallops Station, Wallops Island, Virginia. Smallest was a 30-inch satellite launched on April 13, 1959, on a Vanguard vehicle. The other three were 12-footers -- the first on October 22, 1958, in a Jupiter C rocket, the second in a Juno II vehicle on August 14, 1959, and the third from Wallops Island on December 4, 1960, in a Scout. In all four flights, the launch vehicle failed to make orbit.

The plastic film in the four-ply laminated 12-foot sphere to be launched in a Scout vehicle gives the satellite the toughness it requires to be folded into a compact package for ease of transport into orbit. The aluminum foil serves several purposes -- making the satellite stiff, highly reflective of sunlight and radio waves, electrically conductive, helping regulate satellite temperature, and protecting the plastic film from the intense ultraviolet radiation in the area beyond the protective filter cover of the earth's atmosphere.

By providing stiffness, the aluminum foil permits the satellite to remain spherical without internal pressure as it orbits the earth. After separation of the satellite and payload container, the internal pressure in the sphere equalizes with the outside environmental pressure through an open valve stem in the satellite. Any remaining inflation gas is expected to be lost through punctures made in the satellite structure by micrometeorites.

In making the satellite highly reflective of sunlight, the aluminum foil permits the sphere to be tracked optically throughout the world. Studies conducted at Langley indicate that the shiny aluminum foil will reflect about 80 per cent of the sunlight which falls upon the satellite in orbit.

By making the satellite's outside surface electrically conductive through use of aluminum foil, the sphere itself serves as an antenna for the small radio beacon attached to it for tracking purposes. The satellite is separated into hemispheres by a $1\frac{1}{2}$-inch-wide equatorial gap of an insulating material (mylar), permitting the two hemispheres to form the antenna for the tracking beacon.

The aluminum foil will not keep the temperature of the satellite within the limits required for satisfactory operation of the tracking beacon components. In an effort to obtain better heat balance characteristics, about 20 per cent of the satellite surface area has been covered with a scientific application of white epoxy paint in a pattern consisting of approximately 3,400 two-inch-diameter white dots; in a circle 36 inches in diameter around both the transmitter and battery packages of the beacon, there are about 210 one-inch-diameter dots. For protection against heat while they are in sunlight, the beacon and battery package are covered by 8 by 10-inch rectangles of white paint. The beacon and battery package are thermally decoupled from the satellite through application of the thermos bottle principle for protection against cold while they are in shadow.

The equatorial gap separating the satellite into two hemispheres has an application of white paint to protect the plastic material and prevent the sun from shining through the transparent plastic onto the transmitter and battery packages located inside the surface of the sphere.

The tracking beacon components, consisting of a radio transmitter, a storage battery package, and four solar cell packages -- each containing 70 solar cells -- were designed and contracted by the Radio Corporation of America to NASA design specifications. Each solar cell package is located on the outside skin of the satellite in an arrangement to permit continuous charging of the storage batteries while the satellite is in sunlight. The radio transmitter and the storage battery package are located on the inside skin of the satellite, near the equatorial gap. Printed cable interconnects the various components of the tracking beacon system. The storage batteries will operate the transmitter while the satellite is in shadow, making it possible to have continuous day and night tracking.

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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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RELEASE NO. 61-20-7

FOR RELEASE: IMMEDIATE
February 17, 1961

STATEMENT BY NASA

WASHINGTON, D. C. -- NASA Administrator James E. Webb today named the successfully launched atmospheric density satellite Explorer IX. The 12-foot inflatable sphere was launched by a Scout rocket from Wallops Station, Va., at 8:05 a.m. EST February 16, 1961.

Project officials confirmed this afternoon that the sphere achieved orbit on the basis of visual and photographic sightings by the Smithsonian Astrophysical Observatory tracking network and on radar observation by the Millstone Hill, Mass., facility of the M.I.T. Lincoln Laboratory.

Project officials confirmed yesterday that the burned out fourth stage rocket casing of the Scout had been injected into orbit. NASA minitrack stations are receiving signals from its tracking beacon. Its latest reported orbital elements are:

Apogee: 1,604 statute miles

Perigee: 404 statute miles

Period: 118.552 minutes

Inclination: 38.91°

The beacon on the sphere is not operating. SAO has determined that the sphere is in about the same orbit as the rocket casing. Observations by the Millstone Hill radar show that the sphere is inflated and research scientists at Langley Research Center, Va. under direction of William J. O'Sullivan, Jr. are proceeding with their air density experiments using optical sighting data.

Due to the inclination of the orbit and its relationship to the sun, the sphere will be visible in the United States only during early morning hours and in the southern hemisphere during evening hours. This will continue for at least several weeks. It will not be seen above a latitude of 45° north. It will have a brightness of a star of the fourth magnitude.

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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RELEASE NO. 61-21

FOR RELEASE: Immediate
February 10, 1961

LLOYD NAMED PUBLIC INFORMATION DIRECTOR OF NASA

O. B. ("Bill") Lloyd, Jr., has been appointed Director of Public Information for the National Aeronautics and Space Administration.

Lloyd, a native of Freeport, Illinois, was educated in the public schools of Chicago and Ponca City, Oklahoma, attended the University of the South, the University of Missouri, and was graduated from the Northwestern University School of Journalism in 1938. He is 45.

He was engaged in newspaper work in Chicago and Wichita Falls, Texas, for four years following his graduation, then worked for the United Press as reporter, copy editor and bureau manager for about two years. He spent another two years in public relations work for Hill & Knowlton at the Consolidated-Vultee Aircraft Corp. in Fort Worth, Texas; Miami Springs, Florida, and San Diego, California, and later in his own public relations firm.

Lloyd returned to the United Press in 1946, and remained with the wire service until January, 1959, when he joined the Washington staff of Senator Lyndon B. Johnson. He remained with Johnson until joining NASA.

He lives with his wife, son and daughter at 3901 Tunlaw Road, N. W., Washington, D. C.

Lloyd succeeds to the post held by Walter T. Bonney until November 15, 1960. Shelby Thompson, who has been Acting Director since that date, continues as Director, Office of Technical Information and Educational Programs.

- END -

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: Immediate
February 17, 1961

Echo

Release No. 61-28

CONTRACTOR SELECTED FOR RIGIDIZED SPHERES IN PASSIVE COMMUNICATIONS SATELLITE PROGRAM

The National Aeronautics and Space Administration has negotiated a contract with the G. T. Schjeldahl Company of Northfield, Minnesota for the design, development, fabrication, and testing of rigidized inflatable spheres for its passive communication satellite program, Project Echo.

The contract for approximately $400,000 will be managed by NASA's Langley Research Center, Langley Field, Va., under the direction of the Goddard Space Flight Center, Greenbelt, Maryland, the NASA installation responsible for the communication satellite program. Schjeldahl fabricated the Echo I satellite for NASA.

The spheres are to be fabricated of laminated aluminum foil .20 mil thick on each side of a layer of Mylar plastic .35 mil thick. Each rigidized sphere will be 135 feet in diameter and weigh approximately 500 pounds. Unlike the lighter weight, 136 pound, 100 foot diameter Echo I satellite, in orbit since August 12, 1960, the heavier rigid structure is expected to remain spherical without internal pressure.

For maintaining thermal balance of the sphere within electronic operating conditions when orbiting in direct sunlight, the satellite "skin" will have a thin, uniform coating of black paint on the inside and a dotted coating of white on the outside. The white surface will reflect excessive heat, while the black inner surface will distribute heat to maintain uniformity in temperature throughout the satellite's interior.

Sub-orbital tests of the ejection and inflating mechanism of the rigid spheres will be made from the Atlantic Missile Range using a Thor rocket. The first rigidized Echo passive communication satellite will be launched into a 700 mile orbit from the Pacific Missile Range with a Thor Agena B vehicle during 1962.

Chron.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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FOR RELEASE: SUNDAY AM's
February 19, 1961

Test made 2/21/61

Release No. 61-27

MERCURY SPACECRAFT FLIGHT TEST (MA-2)

A Mercury spacecraft will be launched aboard an Atlas launch vehicle during the next several days in the most severe test of the Mercury program.

Toward the end of an 18-minute flight from Cape Canaveral, Fla., the highly instrumented one-ton-plus craft will be buffted, scorched and squeezed aerodynamically as never before and, hopefully, never again. Purpose of the test is to qualify the intricate Mercury design and structure under the worst conceivable re-entry conditions, far more severe than could be expected in an eventual normal flight and re-entry.

NASA Space Task Group engineers directing Project Mercury have picked a flight curve for the Mercury craft which duplicates the most severe re-entry path it could take after an emergency abort during an orbital launch attempt. The planned flight path will provide:

1 -- A re-entry heating rate 30 percent higher than that of a normal Mercury orbital re-entry. In addition, temperatures will run 25 percent higher on certain capsule points.

2 -- Three times the normal Mercury orbital re-entry air loads, spiking in this test at about 900 pounds per square foot.

3 -- Twice the deceleration G load (gravity) or roughly 16 G compared to a normal orbital re-entry G of 8.

What's more, the flight curve will make these extraordinary stresses occur in rapid succession when the re-entering spacecraft slams into thickening atmosphere 50 to 45 miles high.

The bell-shaped nine-foot high, six-foot based spacecraft is to hit a peak altitude of 115 miles (statute) and land some 1400 miles out in the Atlantic, about 400 miles northeast of Puerto Rico.

As a parallel test objective, this flight involves investigation of the compatibility of the Mercury spacecraft with its Atlas launch vehicle.

Atlas was selected as the launch vehicle for Mercury because of its powerful thrust and its demonstrated reliability as an Air Force ICBM.

The MA-2 test, a research and development launch, has much the same purpose as the MA-1 experiment of July 29, 1960. Since that time a thorough analysis has been made of the MA-1 flight data.

Exhaustive engineering detective work, which included wind tunnel, noise, vibration, heat and stress tests and metalurgical studies has been conducted. However, analyses have not identified a definitive cause of the MA-1 malfunction. As a result of the testing program, changes in the MA-2 vehicle have been made.

1 -- The adapter ring which forms the bond between the Atlas and the Mercury spacecraft has been "beefed up." Additional and stronger cross-members and stringers have been added to provide a stronger connection between the two.

2 -- The upper part of the Atlas has been strengthened for this particular test by the addition of an eight-inch wide stainless steel band. This band will help distribute localized stresses over greater areas.

3 -- Bracing has been changed on the elbow-shaped oxygen vent valve which fits into the top of the Atlas liquid oxygen tank.

These modifications are an interim action to permit an early launch to acquire vital Mercury system test data prior to the availability of the heavier gage Atlas.

The MA-2 vehicle will be highly instrumented to gather more information about the booster phase of the flight. The added instrumentation includes numerous strain gages, thermo-couples, "break" wires, accelerometers and an extensionometer to report physical conditions through the adapter-upper tank area. An additional telemetry transmission canister has been added in one of the side pods of the Atlas to transmit 20 channels of information to ground flight.

The loads placed upon the Atlas structure in the Mercury mission are substantially higher than the Atlas normally experiences.

Following MA-2, Mercury management is planning to use a heavier-skin version of the Atlas which has been used successfully by the Air Force Ballistic Missile Division (ARDC) in launching Samos and Midas -- space payloads heavier and of differing configuration in contrast to the Mercury spacecraft. Delivery to NASA of the thick-skinned Atlas will begin in early spring.

The flight, then, is an important one....important to the spacecraft engineers who want critical stress information such a flight can produce....and important to the ultimate goal of the program.

But as important as the flight is, no one can foreclose against the possibility of failure. Such is the nature of research and development.

Apart from booster considerations, the test programmed for the MA-2 spacecraft would make a metalurgist cringe. It's the sort of test engineers would like to be able to simulate on the ground. But test facilities don't exist -- and may never exist -- which would simulate all of the heating and stress extremes programmed for MA-2.

The position and velocity of the Atlas at the moment of burnout are the keys to the aerodynamic tortures planned for the MA-2 capsule. At burnout, some four minutes after launch, the Atlas should be about 90 miles above the Earth. The bird itself should be cocked at a slight angle of three degrees off the horizontal ~~vertical~~ plane. Laws of physics say that a body released at this angle will re-enter the atmosphere at the same angle.

Slight as the angle may seem, it is twice the angle the spacecraft is programmed to take in re-entering after an orbital mission. Without going into the complex physics involved, such an angle enhances the spacecraft heating rate -- particularly on the afterbody.

Heating on the afterbody should send temperatures as high as 2000 degrees F. for the few critical minutes of re-entry. This would be about 500 degrees higher than a normal orbital return.

Also during re-entry, the spacecraft will be encountering mounting air loads until they reach a maximum -- what engineers call "max q" -- of 900 pounds per square foot. This will hit the spacecraft as it courses into the atmosphere at approximately 13,000 miles an hour. Conversely, the same order of air loads will weigh on the vehicle during booster flight.

During re-entry, temperatures on the blunt face of the capsule's ablation heat shield are likely to hit 3,000 degrees F. If temperatures a few inches off the plastic heat shield surface were being measured, they would be in the neighborhood of 10,000 degrees F.

As in the pattern of past Mercury tests, new systems will be flying for the first time in this test. For one, a trouble-sensing system in the Atlas -- similar in principal to the one which worked so well in the "Ham" flight of Mercury-Redstone 2 January 31, 1961 -- will be operating on a fully automatic, self-contained basis for the first time.

In several Atlas flights, this system, technically known as the abort sensing and implementation system (ASIS), has been operated on an open-loop basis. This was the case in MA-1 where there was no escape system aboard the spacecraft.

This time it can sense impending trouble in the booster and is wired to trigger the escape rocket above the spacecraft to pull the capsule free of the booster.

In addition, then, this is the first flight of the 16-foot escape tower in an Atlas-boosted Mercury test.

At the same time, the spacecraft in this flight does not contain all the systems which will be included in later flights. Notable among those systems omitted in the MA-2 test are the landing impact bag, environmental control system, astronaut couch, control panel and retrorockets.

Bolted to the floor at various points inside the spacecraft are more than 200 pounds of sensing instruments, cameras, recorders, and a telemetry system.

The latter will provide eight channels of continous or commutated information drawn from approximately 200 different sources. This system will transmit continously for most of the flight except for a critical minute or two during re-entry when its signals will not be able to pierce an ionized blanket which will envelop the spacecraft. This system will stop transmitting when the main antenna canister is jettisoned at approximately 10,000 feet before touchdown.

Two tape recorders on board will record the same data being telemetered, including data during the radio "blackout" re-entry phase, and after the telemetry system is turned off at 10,000 feet.

Temperature data will come from about 90 points inside and out of the spacecraft, mostly in the conical section. Information also will be obtained on pitch, yaw, and roll rates, acceleration, attitudes, pressures, vibration, and external noise levels.

Other data channels will inform ground monitors of important flight functions such as escape tower separation, adapter clamp release, capsule separation, and drogue chute deployment.

Overall test control will be exercised by the Mercury Operations Director in the Mercury Control Center. Detailed flight control will be the responsibility of the Flight Director and a staff of flight controllers operating from consoles in Mercury Control Center.

Assuming an entirely nominal flight, the MA-2 flight sequence will go like this:

About two and a half minutes after launch, the Atlas will stage -- its outboard engines burn out and drop off. This signals the escape tower to jettison itself which sheds more than 500 pounds of critical weight. Should the unlikely possibility of an abort condition crop up during the sustainer portion of flight, the system depends on the spacecraft separation rockets at the base of the capsule to get the capsule away from the booster.

About four minutes after launch, the Atlas sustainer will be shut down early purposely by the Atlas guidance system. At this point the Atlas should be about 90 miles above the Earth.

Seconds later, explosive bolts on a clamp ring locking booster to capsule will fire, freeing the capsule. Then small packages of rockets attached to the blunt end of the capsule will ignite, pushing the capsule away from the booster.

By this time, this time, the capsule will have coasted to an altitude of 115 miles and started to arc over on the downward leg of its ballistic path.

When the capsule hits the Earth's atmosphere, it will be moving at a speed of 13,000 miles an hour. Several minutes later, the thickening atmosphere alone will have slowed the capsule to about 700 miles an hour. Before it hits the water, two parachutes will have pared its speed to a mere 20 miles an hour.

When the capsule reaches 21,000 feet, an altitude-sensitive switch called a barostat will deploy a drogue (or ribbon) parachute. The lid on the upper antenna canister will be blown free before a charge ejects the chute. This drogue chute slows the capsule's descent speed from around 700 miles an hour to about 200 miles an hour.

At 10,000 feet, another barostat is to start a similar sequence which opens the main 63-foot cargo chute, designed to ease the capsule down on the ocean. This action releases the main antenna canister, energizes an impact switch, turns on a flashing recovery light and activitates two radio rescue beacons. It also releases aluminum strips to aid radar location. About the same sea-marking materials are released and an under water charge is dropped as additional location aids.

At touchdown, the impact switch will disconnect the main chute and turn off all capsule electrical power except that required to operate location aids.

To date, Mercury has rolled up a significant flight test record in addition to hundreds of wind-tunnel and air-drop tests and mission simulations. The following rocket-boosted Mercury test flights of research and development models have provided a wealth of information:

Big Joe -- September 9, 1959 -- From the Atlantic Missile Range, to test the structural integrity and heating of a research model of the Mercury spacecraft boosted by an Atlas.

Little Joe I -- October 4, 1959 -- From NASA's Wallops Station, Va., to test integration of booster and spacecraft, utilizing a 250,000-pound thrust booster vehicle consisting of eight solid rockets.

Little Joe II -- November 4, 1959 -- From Wallops Station, to evaluate critical low-altitude abort conditions.

Little Joe III - December 4, 1959 -- From Wallops Station, to check performance of the escape system at high altitude. Rhesus monkey Sam was aboard.

Little Joe IV -- January 21, 1960 -- From Wallops Station, to check escape system under high airloads. Rhesus monkey Miss Sam was aboard.

In addition, five production versions, built by McDonnell Aircraft Company, have been test flown.

May 9, 1960, a McDonnell-built spacecraft underwent a test of its escape system in an off-the-pad abort situation. This test was conducted at Wallops Station and only the craft and its escape rocket system were used.

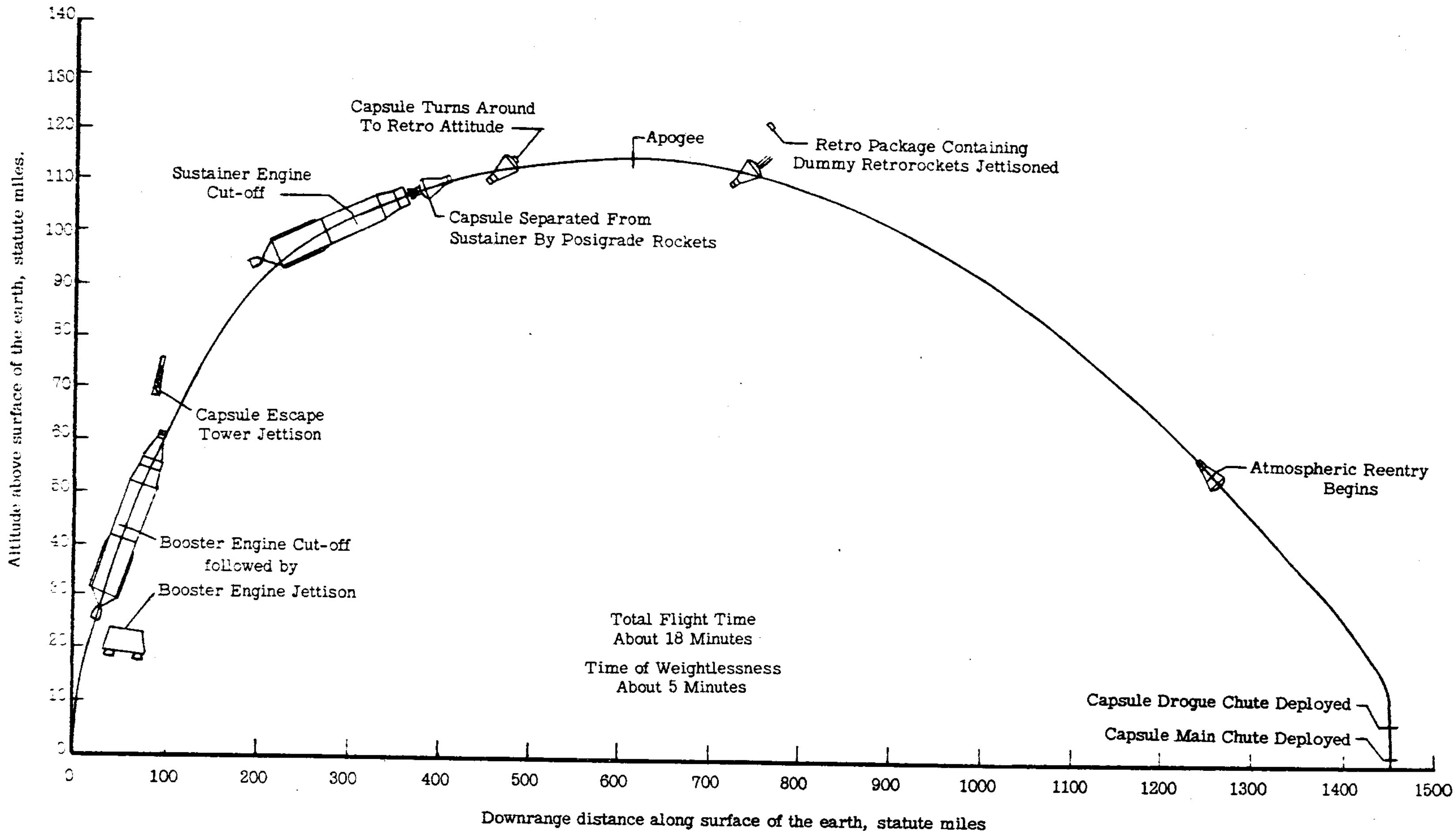
July 29, 1960, a Mercury spacecraft test flight was conducted at Cape Canaveral, Florida, utilizing an Atlas booster. The purpose of the test was to qualify the spacecraft under maximum airloads and afterbody heating during re-entry. A system malfunction prevented attainment of flight objectives.

November 7, 1960, Little Joe V from Wallops Station, to qualify production hardware in an abort under most severe launch conditions anticipated during an Atlas-boosted launch. A system malfunction prevented attainment of flight objectives. This test also will be repeated.

December 19, 1960, a Mercury-Redstone combination was successfully flight-tested from Cape Canaveral, Florida. All test objectives were achieved.

January 31, 1961, a Mercury-Redstone combination was successfully test flown from Cape Canaveral, Florida. It carried a 37-pound male chimpanzee which emerged from the flight unscathed.

SEQUENCE OF EVENTS FOR MA-2 TEST FLIGHT



Chron.

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

FOR RELEASE: February 21, 1961

RELEASE NO. 61-27-1

CAPE CANAVERAL, FLA. -- A Project Mercury spacecraft boosted by a modified Atlas was launched at 9:10 a.m. EST here today. The flight is calculated as the most severe test the spacecraft faces.

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RELEASE NO. 61-27-2

Indications are that the Mercury-Atlas 2 spacecraft flew its programmed trajectory. It hit a peak altitude of 107 statute miles, a peak velocity of 12,850 miles per hour and landed about 1425 statute miles downrange. Elements of the Mercury recovery force are being directed to the landing point.

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RELEASE NO. 61-27-3

CAPE CANAVERAL, FLA. -- A Project Mercury spacecraft boosted by a modified Atlas hit a peak altitude of approximately 107 statute miles and landed 1425 miles downrange. The spacecraft was picked up by a helicopter of Marine Air Group 26 at 9:53 a.m. EST and placed on the deck of the USS Donner at 10:09 a.m. EST.

The spacecraft, a production version, is similar to the one designed to carry man into orbital flight around earth. It was subjected to heating and atmospheric loads much in excess of those anticipated during a normal Mercury flight.

Early flight information indicates that both the Atlas and the spacecraft performed satisfactorily. The craft is to be returned to NASA at Cape Canaveral for complete postflight examination.

\- END -

February 21, 1961

Statement by Robert Gilruth, Director, Space Task Group:

In connection with this successful and very significant milestone in Project Mercury, I am very pleased to be able to make the following announcement:

Within the Mercury flight program, we will be launching manned ballistic flights aboard the Redstone and manned orbital flights aboard the Atlas. A Mercury flight with test objectives similar to those in today's test was essential before manned orbital flight.

The Redstone flight program will be conducted concurrently with our research work on the Mercury-Atlas system. Because of the research nature of the program, it is not possible to forecast specifically when our first manned flight will be launched.

In the Redstone program, we have now selected Astronauts John Glenn, Virgil Grissom, and Alan Shepard to begin concentrated training immediately with the spacecraft programmed for the initial flights and with the personnel who will be involved in the launch, tracking, and recovery operations. The specific pilot who will make each flight will be named just before the flight.

Selection of the pilot team was based on an evaluation of the large amount of medical and technical information accumulated during the initial pilot selection process and the 22-month training program. The evaluation was made at the Space Task Group and, as Director, it was my responsibility to make the final selection.

I would like to emphasize that all seven of the Mercury pilots are eligible for selection for later ballistic and orbital flights. The selection of pilots for later flights will be made on the basis of similar evaluations. These seven men constitute a pool of trained engineer-test pilots who were carefully selected initially and who have now undergone extensive training for manned space flight.

All seven men will work as a team during actual flight operations with the six remaining pilots manning technical support and communications positions.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

RELEASE NO. 61-31 February 28, 1961

NOTE TO EDITORS:

Attached is the text of a "Memorandum of Understanding Between the Federal Communications Commission and the National Aeronautics and Space Administration" for delineating and coordinating the respective responsibilities of the agencies in the field of civil communications space activities.

O. B. Lloyd, Jr.

O. B. Lloyd, Jr.
Director
Public Information

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

MEMORANDUM OF UNDERSTANDING BETWEEN THE
FEDERAL COMMUNICATIONS COMMISSION AND THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The purpose of this memorandum is to provide a basis for coordinating the activities of the National Aeronautics and Space Administration and the Federal Communications Commission in the application of space technology to civil communications in order that their respective statutory responsibilities may be carried out in the national interest. It is mutually recognized that future Presidential or Congressional actions may necessitate some modification of this memorandum.

Following full and complete discussions of the present situation and future objectives, certain conditions of fact and policy guidelines were agreed upon. Both NASA and the FCC recognize as conditions of fact -

(1) that the present state of the technology of communication satellites strongly suggests the feasibility of utilizing such satellites to expand and improve existing facilities for world-wide communications services;

(2) that a substantial amount of further research and development is necessary to demonstrate both the technical and economic feasibility of utilizing communication satellites on a commercial basis;

(3) that in accordance with traditional communications policy in this country, overseas public communications are pro-

vided by private enterprise, subject to Government regulation, and that at the present time overseas voice communications are provided primarily by a single company and overseas record communications are provided by several companies;

(4) that the FCC and NASA are concerned with the nation's total communications capability from the points of view, respectively, of civil communications policy and the commercial utilization of space technology; and that existing common carriers and others are interested in participating in the development of space telecommunications technology to expand and improve world-wide channels of communication through private expenditures; and

(5) that the congestion and technical limitations of the radio spectrum presently useful for world-wide communications are such that without communication satellite technology the spectrum probably cannot support the very substantial increases in capacity necessary to satisfy new services, such as transoceanic TV and wide-band data transmission, or to satisfy the anticipated expansion of ordinary types of services.

On the basis of the foregoing observations, both NASA and the FCC affirm the following propositions as guidelines for the coordinated conduct of their respective activities:

(1) The earliest practicable realization of a commercially operable communication satellite system is a national objective.

(2) The attainment of this urgent national objective in the field of communications may be accomplished through concerted action by existing agencies of Government and private enterprise.

(3) The statutory authority of NASA and the FCC appears adequate to enable each agency to proceed expeditiously with the research and development activities necessary to achieve a commercially operable communication satellite system. Special problems which may arise in connection with the regulation of a commercially operable system are being explored by both agencies, and may result in legislative recommendations at a later date.

(4) In accordance with the traditional policy of conducting international communications services through private enterprise subject to Governmental regulation, private enterprise should be encouraged to undertake development and utilization of satellite systems for public communication services.

(5) Both NASA and the FCC will conduct their respective activities with a full exchange of information so as to accelerate necessary research and development and to coordinate Governmental actions necessary to attain the national objective.

(6) NASA, in appropriate cooperation with other Government agencies, will continue to direct its activities in this field toward the advancement of space technology and its application to civil communications.

(7) The FCC, in appropriate cooperation with other Government agencies, will continue to direct its activities in this field toward the development of communications policy and the implementation and utilization of space telecommunications technology through the licensing and regulation of United States common carriers. In this connection, the FCC will take into account the total Government needs for communication services where such needs normally are provided by privately owned facilities.

(8) Both NASA and the FCC, consistent with the policies of the Department of State, will facilitate international cooperative activities in the field of space telecommunications within the framework of this nation's international obligations and aims.

(9) Existing inter-agency organizations and procedures for coordination will be employed with respect to the allocation and assignment of frequencies necessary to support both the research and development and the operational phases of a civil communication satellite system.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Hugh L. Dryden
Deputy Administrator

FEDERAL COMMUNICATIONS COMMISSION
By Direction of the Commission

Frederick W. Ford
Chairman

February 27, 1961

61-32

FOR RELEASE UPON
PRESENTATION

Statement by

Hugh L. Dryden
Deputy Administrator
National Aeronautics and Space Administration

before the

House Committee on Science and Astronautics

February 27, 1961

Mr. Chairman, gentlemen; I am pleased to have this opportunity to speak to you at this early point in the Congressional session on the ROVER program aimed at the development of nuclear propelled rocket systems. We in the NASA are particularly aware of the large advantages that nuclear energy offers in our space program.

The Space Act establishing the NASA assigned to us responsibility for the civilian aeronautical and space activities of the United States. The space activities include a responsibility to develop the vehicles and their components that are required to carry instruments, equipment, and eventually, man through space. In fulfilling this responsibility, it is essential that we give careful consideration to the long-term demands of the space program and the technology that must be developed to insure that this nation has the capability of performing any desired mission in space.

Our evaluations have made it clear that the space program will require the application of nuclear energy sources in order to provide the large amounts of energy that are required to move about freely in space. We are confident that the future of extensive manned exploration of the moon and the planets rests on the mission capabilities afforded by nuclear propulsion systems. For this reason, we consider the development of nuclear propulsion systems as our major advanced propulsion development program. The ROVER program must proceed as rapidly as the technology will allow. We are evaluating the needs of the program to insure that all necessary resources are provided.

The large performance advantage of the nuclear rocket over chemical rockets for long range or high energy missions results from the high specific impulse (two to three times the value of our chemical combustion systems) that can be provided by the nuclear system. As you know, the specific impulse is a measure of the efficiency of a propulsion system. A high specific impulse means that a relatively small amount of propellant must be expended to perform a desired mission. This reduced propellant consumption permits an increase in the payload that can be delivered to distant space targets for a given gross weight of rocket.

This Committee has received presentations of advanced vehicle concepts from the staff of NASA over the last few years. I believe Mr. Finger will discuss this in greater detail but I would like to summarize some of our calculations. One of these concepts has been the Nova vehicle which was described to you in terms of a manned trip to the moon and return to the earth. In an all-chemical version, it appears that the Nova vehicle should have a takeoff thrust of at least nine million pounds in order to meet the mission requirements of direct flight to the moon and return. Such a vehicle would utilize at least six of the one and one-half million pound thrust F-1 engines currently being developed for the NASA. Studies of versions of the Nova vehicle utilizing nuclear propulsion in the upper stages show that the initial thrust can be reduced by a factor of two or three. While we have not as yet obtained the full results of analyses of comparative costs, we can speculate that a nuclear-Nova will be very competitive with an all-chemical version in the matter of cost, since vehicle size is an important factor in the costs of test operations, vehicle hardware, test facilities and launch stands.

This large performance potential of the nuclear rocket system provides good reason for confidence in its successful development and application. It must, however, be recognized that technical problems do exist and some areas of the technology are at this time unevaluated. Our program is directed at solving these problems and clarifying the unknowns. The data that have been obtained to date are very encouraging, particularly for a point so early in the development of this advanced technology.

Although the NASA is charged with responsibility for the development of the systems that will be used to propel our systems into space, we recognize that the Atomic Energy Act, our own Space Act which requires that we effectively utilize the scientific and engineering resources of the United States and avoid duplication with other agencies, and the strong technical capability and experience of the Atomic Energy Commission in all nuclear matters require that we work jointly with the Atomic Energy Commission in the development of nuclear powered space systems. In order to suitably effect such joint efforts, we have established the jointly staffed AEC-NASA Space Nuclear Propulsion Office with Headquarters in Germantown, Maryland. This office is charged with the responsibility for management of all aspects of the program to develop the nuclear rocket engines that will be required for test and mission purposes. Mr. Finger, who will appear before you during these hearings, has been appointed as the Manager of this joint office. He reports to Dr. Pittman, the

Director of the Division of Reactor Development in the AEC and to Major General Ostrander, the Director of the Office of Launch Vehicle Programs in the NASA.

It has been agreed that in accordance with the statutory responsibilities of the two agencies, the NASA is responsible for the development of the non-nuclear components that are required in nuclear rocket systems and for integration of the reactor and these non-nuclear components into reliable and operational engines. In addition, the NASA is responsible for the development of the vehicles that will be required.

The principal effort in the ROVER program to date has been supported by the AEC and consists of the reactor testing that has been conducted by the Los Alamos Scientific Laboratory. Up to the present time, the NASA funds have supported the development of liquid hydrogen turbopumps and nozzles that will be used in the next series of reactor tests to be conducted by Los Alamos. That series of tests will start toward the end of this year and is designated the KIWI-B series. In addition to the development of non-nuclear components required for reactor testing, the NASA has let four contracts to study various methods of flight testing nuclear rockets. Looking forward to the time when special development facilities will be required for engines and vehicles, we have initiated a study of the requirements of a National Nuclear Rocket Development Center to supply us with a master plan for such facilities. Along with these contracted efforts, a substantial amount of effort has been devoted by NASA at its in-house field centers, the Lewis Research Center and the Marshall Space Flight Center, to the study of potential applications and missions for nuclear rockets and to research on the non-nuclear components of nuclear systems.

As you know, proposals have been invited from industry to serve as the basis for the selection of an industrial contractor or contractor team that would have responsibility for the development of a nuclear rocket engine using the reactor technology developed by the Los Alamos Scientific Laboratory. The invitation was sent out by the AEC-NASA Space Nuclear Propulsion Office. The proposals are due on April 3, 1961. The contractor will be selected jointly by NASA and AEC, the work will be funded jointly by NASA and AEC, the contract will be signed jointly by NASA and AEC, and it will be administered by our joint office.

We are, therefore, establishing the government-industrial team that will give us the capability to proceed with the program diligently and as fast as the technology develops.

NAS RELEASE No. 61-32

Exp.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

February 25, 1961
12:20 a.m. EST

NASA scientists said today all available evidence shows that it is highly improbable that the S-45 ionosphere beacon satellite achieved orbit. The satellite was launched by a Juno II vehicle from Cape Canaveral at 7:13 p.m. EST yesterday.

There was a malfunction shortly after booster separation. Because of a loss of radio transmission from the satellite, the sequence of events that followed could not be determined immediately. Since then no tracking station has acquired data that would indicate an orbit.

A study of available flight information is continuing.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON 25, D. C.

RELEASE NO. 61-34 February 27, 1961

NOTE TO EDITORS:

The attached paper entitled "Evaluation of U.S.S.R. vs. U. S. Output in Space Science" was prepared by NASA upon the request of the Committee on Science and Astronautics, U. S. House of Representatives.

O. B. Lloyd, Jr.

O. B. Lloyd, Jr.
Director
Public Information

February 25, 1961

EVALUATION OF USSR VS. US OUTPUT IN SPACE SCIENCE

GENERAL IMPRESSIONS

The average quality of Soviet scientific research is the same as that of the United States. This conclusion is based on perusal of their literature and on personal contacts between scientists of both countries in conferences held between 1956 and 1960, both in nuclear physics and in areas related to space research.

The range of ability of Soviet scientists is also approximately the same as that of US scientists. A few are brilliant, as good as this nation's best physicists, and the majority do conventional but necessary research.

It is a striking fact that in spite of equality of talent in US and USSR science, nearly all the highly original work in space research has come out of the US program. The first two Sputniks had little or no scientific apparatus, apart from a biological experiment; and while the third Sputnik had a great deal of interesting geophysical apparatus, this flight was never followed up by the second generation of experiments with which the Russians could have capitalized on their experience with Sputnik III. However, these references relate only to basic scientific investigations and not to technology. The USSR has achieved a number of successes, such as the Lunik III moon shot and the recent space cabin launchings, which were great achievements in space technology.

The US, on the other hand, has been responsible for:

1. first detection of trapped energetic particles (Van Allen belts);

2. launch of Explorer VI and Explorer VII energetic particle satellites; measurement of energy distribution and time variation of radiation in the Van Allen belts; coordinated observations of radiation belt and red auroral arc over Colorado;

3. launch of Pioneer V space probe;
communication with earth out to distance of 23 million miles;
study of properties of interplanetary space;
detection of cloud of energetic particles sweeping over Pioneer V en route from sun to earth at the time of a solar storm;
correlation between ground-based atmospheric data and data received simultaneously from Pioneer V in deep space and from Explorer VII near to earth;

4. correlation between solar weather activity and atmospheric density, via satellite drag measurements;
first measurement of air density at an altitude of 1000 miles, using drag data from the ECHO satellite;

5. launch of the Ionosphere Satellite;
measurement of density and temperature of electrons and ions in the upper atmosphere;
measurement of ionospheric disturbances during the solar storm of November 1960;

6. satellite contributions to geodesy and celestial mechanics: precise measurement of variations in sea level, gravitational perturbations by sun and moon, effect of solar radiation pressure;

7. TIROS cloud-cover photographs; and

8. ECHO passive communications experiment.

Another significant fact appears in the comparison of US and USSR papers published in the periodical literature or presented at international conferences: The US and USSR papers are of comparable quality but the number of US papers greatly exceeds the USSR contribution. This very sizeable discrepancy in the level of effort constitutes the most significant difference between the US and USSR space research programs. The USSR has capitalized skillfully on the advantage in payload capability which it acquired from its early successes in missile development. It has concentrated on a small number of flights, and has chosen its missions for these flights with close attention to their impact on world opinion and their effectiveness in reinforcing the public image of USSR strength in science and technology. Yet the USSR has done relatively little in space science, considering the resources at its command in payload capability. It is very difficult, for example, to understand why the USSR failed to follow up the remarkable flight of Sputnik III with further geophysical satellite experiments.

Perhaps the explanation is that Soviet scientists are not in close contact with their program planning authorities, and have not been able to participate effectively in the formulation of their space program. The gathering momentum in the US space science program, and the remarkable variety of fields in which highly original results are being obtained, must be credited, in part, to the insistence of US authorities on the development of a sound and broadly-based program in space science, and to their continuing efforts to enlist in the program an increasing fraction of the country's scientific community.

There is another circumstance which has probably had a major effect in determining the relative levels of effort in US and USSR space research. This is the fact that the US has had a tradition of strong support for research over the last several decades, and has developed a powerful base for scientific operations in this country, including many large laboratories with highly trained staffs. This is true in nuclear physics and solid state physics, as well as in the earth sciences and other disciplines from which space research draws its problems and techniques. The base of research in the USSR, on the other hand, is not as deep as in the US. It is new and relatively thin. For this reason the USSR scientific effort is spotty, with excellent work in certain fields on which Soviet interest has been concentrated for one reason or another, whereas work in other fields of equal scientific interest is poor or entirely missing. Because the US has tremendous scientific resources at its command it has been able to develop a vigorous program in atmospheric physics, auroral phenomena, geophysics, sun-earth relationships, and trapped particle research without appreciably reducing its level of effort in other fields of research. We have in fact developed an entirely new field to a very high level of activity in the short space of two years. The Russians may not have the reserve strength in laboratory facilities and trained talent to do this without disrupting established areas of research, and perhaps this is the primary reason for the paucity of their achievements in space science thus far.

It is important to note that this reflects the situation at the present moment. In making an assessment of the Soviet position it is also important to look at the rate of change of their effort, in addition to the current level. The USSR is believed to be training its scientists at a rate several times greater than the rate of training in the US, and it is entirely possible that the USSR may strengthen the weak spots in its scientific structure and move ahead in an effort to overtake us in every important area of research, in the course of the next several years or perhaps the next decade. It may be noted again that the intrinsic ability of the Russian scientific community is in no way inferior to that of our own; and that, therefore, there is no reason why they cannot overtake us in this period if we do not continue to develop and to strengthen our program.

Figures on the number of papers presented at international meetings suggest that the Russian level of effort in space science has not increased appreciably between the Moscow CSAGI meeting in 1958 and the Nice COSPAR meeting in 1960 in spite of the greater rate of training of scientists in the USSR. It is possible that the talent being trained in this area is still at the graduate student level and has not yet reached the level of responsibility at which this effect can be felt in Soviet contributions to conferences. It is the impression of a US authority on upper atmosphere theory that this is the case in atmospheric physics and in sun-earth relationships. In any case, the contrast between the output of the USSR space research program and our own cannot have failed to impress the Soviet scientific community itself, and some elements of the USSR government. USSR scientists may succeed soon in persuading their government to initiate a more vigorous program in space physics under the stimulus of our own successes in this field.

<u>In summary</u>, the USSR space science program has dissipated some of its momentum after the initial successes of the Sputnik launchings; while the US program has picked up momentum from a

standing start, and now surpasses the USSR effort in its breadth of interest, originality of concept, and volume of research. However, we should anticipate that the Russians will respond to this challenge with a more vigorous space science program of their own in the future.

SPECIFIC IMPRESSIONS

QUALITY OF PRESENTATIONS

USSR papers cover the same range as those in the US. The top stratum of individual talents in the USSR scientific community is also comparable to ours, according to impressions gained in meetings and by an examination of the translated literature. The Russians have very capable people working in some fields, such as cosmic radiation and energetic particle measurements and are also strong in mathematics, celestial mechanics, astrophysics, seismology, and observational aspects of oceanography. In certain other areas of the earth sciences and astronomy, either directly or indirectly related to the space program, the USSR makes a less favorable showing in comparison with the work in the United States.

For example, the USSR has published little on the geodetic applications of satellites, a most fruitful field of endeavor in the United States, and a major source of important developments in geophysics. The analysis of satellite orbits to obtain density data also has been carried out at a high level of activity by several groups in the US. In particular, the discovery of a correlation between satellite drag and solar activity, one of the most significant developments in this field, was made by L. G. Jacchia at the Smithsonian Astrophysical Observatory, and his work has since been refined and extended to reveal important diurnal variations. There has been relatively little USSR work published on this important and interesting problem.

It is possible that this particular field of geodesy is considered sensitive by the Russians, and that for this reason a substantial amount of USSR material has been held back from publication.

QUANTITY OF PRESENTATIONS

The United States stands strongly to the fore in the quantity of work, in its volume, and in the number and variety of fields in which we have been doing original work. The contrast between the level of our effort and that of the USSR appears both in the comparison of presentations at international meetings, and in the survey of US and USSR scientific periodicals.

Presentations at International Meetings. Two major international conferences in space research have been held in the last few years. The first of these was the CSAGI conference in Moscow, in July 1958. The US sent a large delegation to this conference. U.S. contributions to the program were varied and extensive, and gave an impression of strength in our incipient space science effort, in spite of the weakness of our vehicle capability at that time. The next international meeting in the field was arranged by COSPAR, and convened in Nice in January 1960. The number of US and USSR contributions to these meetings is listed below:

	US	USSR
CSAGI (1958)	39	15
COSPAR (1960)	40	10

The US and USSR numbers are about the same for the two meetings. It might be noted that the Goddard Theoretical Division alone read five papers to the COSPAR meeting, half as many as the entire USSR contribution, and ranging over the fields of celestial mechanics, geodesy, the moon and planets, meteorites, and trapped particles. A perusal of the table of contents of the recently published Proceedings of the COSPAR Conference drives home the point that the US program contrasts very favorably with the USSR effort in its breadth and in the fullness of participation of the American scientific community.

Volume of Publication. A bibliography has been compiled of USSR periodical literature in space physics, appearing in reputable Soviet publications (PROCEEDINGS of the Soviet Academy, GEOPHYSICS BULLETIN of the Soviet Academy, SOVIET ASTRONOMY, SOVIET JETP, SOVIET PHYSICS EXPRESS) and also the (British) JOURNAL OF PLANETARY AND SPACE SCIENCE.

For comparison, NASA has examined the contents of the JOURNAL OF GEOPHYSICAL RESEARCH for the years 1958-1960. The JOURNAL OF GEOPHYSICAL RESEARCH is the principal medium for the publication of space physics in the US, and contains approximately half of all papers on this subject and related topics in the earth sciences.

The Soviet series, ARTIFICIAL EARTH SATELLITES, has not been included in the USSR lists because it does not constitute a part of the periodical literature on current research to be compared with the JOURNAL OF GEOPHYSICAL RESEARCH.

The table below lists US and USSR contributions gathered from these sources for the years 1958-1960. The 1960 figures are extrapolated from the volume of publications for the first six months of 1960.

	1958	1959	1960
USSR	5	8	17
US (JGR)	5	64	111

We see that the US and USSR efforts started at comparable levels, that the USSR effort has shown a moderate increase in the last three years, and that the US effort has shown a greater increase. It appears from these figures that the US has reacted vigorously to the challenge of the first Russian successes in space rocket technology. Our space program has been able to draw on the resources of US research, and has greatly exceeded the modest increase in the Russian effort over this period.

The contrast in the level of US and USSR efforts in space physics is in fact so great that we may expect a counter-reaction from the USSR, in the form of a greater emphasis on scientific effort in their space program. There may in fact be a hint of this development in a recent unusual display of initiative on the part of the USSR, through its proposal for the organization of a conference on problems of lunar research to be held in Leningrad in December of this year under the joint auspices of the USSR Academy and the IAU.

<u>Detail of Publication; Openness at Meetings</u>. In the first post-Sputnik period, USSR reports on satellite experiments and calculations were sketchy, both at meetings and in the periodical literature. The papers lacked the details needed for the

formation of an independent judgment regarding the validity of results presented. It should be noted that this secretiveness was confined to the rocket and satellite area; in other fields of physics and the earth sciences USSR publications and presentations have been relatively open and detailed. Another factor may contribute to the sketchiness of some of the Russian presentations. It appears to be the practice of the USSR to send a relatively small delegation of leading Soviet scientists to these meetings, who then read review papers on the work of a large number of their colleagues. For this reason some of the areas of research covered in their papers may lack the intimate understanding of the subject which is required to answer pertinent questions.

Since 1958 USSR publication policy seems to have relaxed to some degree, although USSR publications on orbit data and tracking systems are still virtually non-existent.

Timeliness. Originally the USSR appeared to favor newspaper releases over publication in the professional literature, for early reports on their satellite results. After the Moscow CSAGI meeting this situation improved considerably. Preliminary notes on USSR results have been appearing as promptly as in the US, about six to eight weeks after launch for the most interesting results. For example, Lunik I was launched on January 2, 1959, and the Vernov note describing cosmic ray and trapped particle measurements was submitted for publication in the USSR ACADEMY PROCEEDINGS on February 25, 1959. Lunik III was launched early in September of 1959, and the paper describing the photographs of the hidden face of the moon was received for publication in the USSR ACADEMY PROCEEDINGS on November 14, 1959.

These examples refer to the publication of preliminary notes, equivalent to our letters to the editor. The detailed papers appear somewhat more slowly than in the US, typically after a delay of 12 months vs. six months in the US.

Channels of Communication. As noted above, in the first period of the USSR space program the Russians appeared to prefer qualitative newspaper accounts for the layman to quantitative publication in serious scientific journals. An examination of the literature suggests that this is no longer the case. As in the US, newspaper articles on achievements of exceptional interest appear in the Russian press or public media at approximately the same time their preliminary scientific reports are published. The impression of this earlier but no longer valid circumstance has persisted because the newspaper stories are picked up immediately and translated quickly by the Department of Commerce and other agencies for distribution to government personnel; whereas the Academy proceedings and scientific literature do not appear in translated form until a much later time. For this reason US scientists often obtain their first reports on interesting results through a PRAVDA translation.

It appears that the Moscow CSAGI meeting was responsible for the change towards normal channels of scientific communication and away from the public press. The detail presented in the US papers at the Moscow meeting, and the strongly critical attitude of the US delegation regarding Soviet suppression of detail, seemed to have had a beneficial effect. The dates of publication quoted above for the Lunik I and Lunik III experiments demonstrate this clearly. It seems reasonable to say that Soviet officials and scientists have shown a positive response to US criticism in these matters and can no longer be censured as severely on this basis as in 1958. An exception is the area of tracking systems and orbit information, in which USSR disclosures are still inadequate.

END

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D. C.

RELEASE NO. 61-35

PRESS CONFERENCE

MERCURY-ATLAS No. 2

Cape Canaveral, Florida
21 February 1961

PRESENT:

ROBERT R. GILRUTH, Director, Project Mercury

WALTER C. WILLIAMS, Director of Operations, Project Mercury

COL. PAUL E. WIGNALL, Air Force Ballistic Missile Division

ADMIRAL F. V. H. HILLES, Commander of the Recovery Forces

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THE MODERATOR: Ladies and Gentlemen, I would like to introduce Robert R. Gilruth, the Director of Project Mercury.

MR. GILRUTH: Ladies and Gentlemen, I would just like to say that this has been a very successful test that has just been completed. Although we haven't ourselves seen the capsule, of course, our reports are that it appears to be in excellent condition.

I don't have to remind you of the importance of this particular test to the overall Mercury program. As you know, this covers the most critical of the various abort and re-entry conditions, particularly critical for capsule structure, the heat protection of the aft part of the capsule, the parachute canister, and the G load in the capsule.

This test gives us new confidence in the integrity of the system, although I would like to caution you all that there are still a number of critical tests that have to be made before we contemplate manned orbital flight.

Also during this test was demonstrated the compatability of the Atlas booster and the Mercury capsule. It is also worth mentioning here that the system carried a live automatic abort system which functioned perfectly through the launch phase.

I would like also, before calling on the individuals here with me, to compliment the whole Mercury team, the McDonell Aircraft Corporation who manufactures and pre-flight tests the capsule, the NASA people who have been working with all the various members of the team, the DOD elements here, of the Navy who have been doing such a good job of recovery, the Range and Ballistic Missile Division of the Air Force which prepared the booster for us, and, of course, their agencies like Convair and Aerospace.

I would like to turn this over next to Walt Williams but I have another announcement that I would like to make after we go through the details of the flight.

Mr. Williams.

MR. WILLIAMS; I think, as you know, the pre-flight count proceeded-- Actually, as you know, the count was perfect. There were no technical difficulties with either the capsule or the booster during the count. The hold we had was to let some rain squalls go by down in our primary recovery area and they, indeed, were the only holds encountered during the count.

I think it is well, too, to indicate the scope of this operation. This was a considerably longer range shot than our recent Redstones, as you all know. We broadened our base, also, from the standpoint of our network. We had the meter station up today which is part of the world net for Mercury. It was manned. We had flight controllers on board. We were able to track, and we received telemetry data. We had reports from the flight controllers there, and this was at extreme range from Bermuda from the standpoint of the direction this particular shot went.

Further, we had an additional exercise for our flight controllers here at the Cape, and I would like to say their hard work in many simulated missions and long hours waiting for these missions is surely paying off for us. The performance of these people today was excellent.

Now, getting into some of the things we learned out of this exercise today, we were able to send commands to the capsule for -- not retro-firing, since we did not have live retros, but for retro-jettison, but the type of signal would be the same in either case, and the range over which we sent this was more than comfortable for any situation which we would encounter on our orbital missions.

I think Mr. Gilruth mentioned the Atlas-Mercury compatability. This, of course, has been a problem we've all been concerned about. We learned additional things. We know the cabin held pressure well all through the flight today and demonstrated cabin integrity. The structure of the capsule itself withstood everything that was put upon it. The sequence system which, as some of you people who have sat through these with us know, has been-- The overall sequence system booster-capsule combination has caused some problems for us. Again, the capsule system did exactly what it was told. It was given all the right signals by the booster, and worked very well.

The telemetry was good locally and downrange. It was received as far down as Antigua by the airplanes in the immediate landing area. We know from the quick visual inspection of the capsule on board that the capsule definitely got hot, as expected, however the structure is in excellent condition and looks much as we would have e¨pected it to look after a mission such as this.

Again, we have had another test on our recovery system, and on this I am talking about the airborne recovery system -- parachutes, and so on. These all functioned when and in the manner in which they were intended. The stabilization system appeared to work well. And, again, this is our first test of the automatic abort system on an Atlas in a live case. It gave no signals when it shouldn't have. It should have given a signal after burn-out, which it did; and of course this was after the capsule was separated. So this has increased our confidence there.

The tracking data here was excellent. We also used our real time trajectory information, such as we will have to have on our orbital flights where data is taken here, transmitted to the Goddard Space Flight Center in Beltsville, Maryland, the computers there operate on the data and send it back down here, and display it in our control center. We had a very good exercise of this part of our in-flight command system, and, of course, the training of the crews at that end of the line, too, on a mission such as this in preparation for our orbital flights.

I think that about covers what I have to say at this time.

Mr. Gilruth: All right.

Colonel Wignall?

COLONEL WIGNALL: Well, the performance of the Air Force contractor team launching the booster, and the performance of the booster itself, were essentially nominal and optimum performance. As far as the personnel are concerned, we are very, very pleased with the BMD efforts of my people here in the 6555th in the launch management. The contractor team worked very, very smoothly. We had essentially no difficulties at all in preparation of this vehicle and in this launch.

It was a very, very smooth operation, and I would like to express my congratulations to the contractor team who did such a good job. Your names are mentioned in your releases.

As far as the booster performance was concerned, it was a very smooth launch operation. The flight was very smooth; it looks like all of our performance characteristics were just exactly what we expected they would be in the desired ranges.

The flight today reaffirms the confidence that we in the Air Force have always had in the Atlas as a basic space booster.

I don't think that I have anything more to add.

MR. GILRUTH: Thank you very much.

Admiral Hilles.

ADMIRAL HILLES: Of course, the recovery was greatly facilitated by the fact that the capsule landed well within the predicted area. This speeded up our job a lot and, of course, made it much easier, and we are very happy that they could put it as close as they did.

The weather that was mentioned was primarily one large rain squall of about 20 miles extent which passed over in about 15 minutes. This was prudent, while it was close to the recovery area, to hold it off, I think.

The Task Force Commander, who is Captain G. R. LeRoque, of Kankakee, Illinois, was in charge of the operation, in the GREENE, out in the predicted primary landing area.

The first information that we got was sighting of the re-entry phenomena from the USS DONNER, which is a Landing Ship Dock, commanded by Commander Brackett, of Gastonia, North Carolina, and at the same time from the GREENE, which was about 40 miles uprange from the DONNER. Immediately thereafter an electronic indication, at about 11 minutes after lift-off, was received from one of the airborne early warning aircraft which was stationed pretty nearly at the actual impact point of the capsule eventually. This WV-2, Squadron 2, is commanded by Commander Bragg, F. B. Bragg, of Norfolk, Virginia.

Immediately upon this sighting and electronic indication, the DONNER, which had the Marine helicopters aboard, was alerted, and the DONNER and the GREENE both proceeded to the approximate location of the capsule which was, of course, at that time still coming down by its parachute. We immediately got word that the helicopters were under the positive control and that the airborne early warning plane actually was over and had sighted the capsule. This information we received 35 minutes after lift-off, so with an 18-minute flight, approximately, that's about 17 minutes after it had landed.

About the next thing that occurred was that the DONNER got vectored in by this large aircraft, got over the capsule at 9:53, which was 42 minutes after lift-off, and lifted the capsule from the water, returning it to the LSD itself. The actual spacecraft was placed on board the DONNER at 10:06. This is the corrected time from what we originally gave which I believe was 10:09. This was an error. This was 55 minutes after lift-off and about 37 minutes after actual landing.

The position of the recovery was approximately 410 miles east-northeast of Roosevelt Roads. The Landing Ship Dock DONNER will proceed with the capsule to Roosevelt Roads, and we haven't got the exact estimated time of arrival yet, but I would say -- just guessing, now -- around noon tomorrow.

For your information, the Heli-Pilot who actually picked it up is Lt. Schulte, U.S. Marine Corps, of Quincy, Illinois, and his co-pilot was 1st Lt. Bood of Crystal Lake, Illinois. Both are members of MAG 26, which is commanded by Colonel P. T. Johnson, U.S. Marine Corps, of Omaha, Nebraska.

That's about all I have to say.

MR. GILRUTH: Thank you.

There is a question?

QUESTION: Could a man have survived this flight today, sir?

MR. GILRUTH: Well, on the basis of what we know so far on cabin pressure and cabin temperature, and accelerations he would experience, the answer is yes.

We would like to have a look at the capsule to make sure there aren't any places on it-- Without actual, close examination of the capsule, I'd like to have some reservation about it.

QUESTION: What about "G" forces, temperatures, period of weightlessness?

MR. GILRUTH: I don't believe I can answer all of those. The maximum "G" was about 16-1/2 "G" in this steep re-entry. And the temperature data, the only figure I recall from the monitor is the cabin air temperature which didn't get over 90 degrees.

QUESTION: How about weightlessness?

MR. GILRUTH: I don't know how long this would be.

MR. WILLIAMS: We would have to get on-board tape data to get the total time.

QUESTION: Do you have any knowledge during the re-entry what the degree of temperature was in the capsule at all?

MR. GILRUTH: This, of course, has to come from the on-board data, because of the telemetry blackout during the ionization period during re-entry. We expect we will have these data from the on-board recorders, but we know we can't get it from telemetry.

QUESTION: Will this flight aid our Mercury-Redstone program also?

MR. GILRUTH: Yes; I would say this adds to our confidence in the systems that are used jointly in the capsule for both flights. The electrical systems, the power and abort systems, and parachute systems are identical.

QUESTION: Could we talk times at all with regard to, say, a manned shot for Mercury, or a monkey shot?

MR. GILRUTH: I don't think it would be fruitful to talk times, because, frankly, I don't know. I think you all know that in the last shot of the Mercury-Redstone we uncovered some problems with the landing bag system in particular that we have to do quite a lot of work on. This we are pursuing, and contingent on the outcome-- These include drop tests, tank tests, various flotation tests, wave trains, and so on. There also is some work that has to be done on the launch vehicle before we are in a position to say when the next flight will go.

QUESTION: Will you use the same type of Atlas in your next flight?

MR. GILRUTH: I think the next Atlas will be the thick-skin Atlas. This was an interim beef-up applied in this case which I believe was made clear in the earlier press articles.

QUESTION: What will be the mission of the next Atlas?

MR. WILLIAMS: If this flight that we made today, in data form, looks as good as it does right now -- which means it wouldn't have to be repeated, or any additional development work done -- our next flight will probably be a flight which will go up to just below orbital speed. It will be an insertion abort. In fact, it will be essentially a long, trans-Atlantic shot.

QUESTION: Will you carry a primate in that shot?

MR. WILLIAMS: No.

QUESTION: How far do you think it will go? About 3,000 miles?

MR. WILLIAMS: I wish you hadn't put it in miles. It will be essentially across the ocean -- whatever the distance happens to be.

QUESTION: If this were successful and the next Atlas were successful, would you try a Chimpanzee orbital in the following shot?

MR. WILLIAMS: I don't think we want to go that far now in predicting what we are going to do.

QUESTION: We have a re-entry speed of 12,850 miles per hour. Is that right?

MR. GILRUTH: The figure I remember was 19,000 feet a second. What does that translate to in miles?

MR. WILLIAMS: That was the maximum speed we had on the flight. That's inertial.

QUESTION: Is that actual?

MR. GILRUTH: That 19,000 is inertial, not speed through the air.

QUESTION: Is there any information available on the heat shielding?

MR. GILRUTH: All we have is the eye witness report that the heat shield looked to be in good condition and looked quite similar to the Big Joe shield, which you may have seen when they came back early in the program.

This is an ablation type shield.

QUESTION: What was the hold at 18 seconds?

COL. WIGNALL: That is an automatic program hold. It is standard with all Atlas launches. It is a momentary hold and is standard with all Atlas launches.

MR. GILRUTH: If there are no other questions on the shot I would now like to read an announcement.

In connection with this successful and significant milestone test I am pleased to be able to make the following additional announcement:

Within the Mercury Flight Program we will be launching manned ballistic flights aboard the Redstone and manned orbital flights aboard the Atlas. A Mercury flight with test objectives similar to those in today's flight was an essential step before manned orbital flights could be attempted. The Redstone flight program will be conducted concurrently with our research work on the Mercury-Atlas system. Because of the research nature of the program it is not possible to forecast specifically when our first manned flight will be launched. In the Redstone program we have now selected Astronauts Glenn, Grissom and Shepard, in alphabetical order, to begin concentrated training immediately with the spacecraft programmed for initial flights and with the personnel who will be involved in the launch, tracking, and recovery operation. The specific pilot who will make each flight will be named just before the flight.

Selection of the pilot team was based on evaluation of a large amount of medical and technical information accumulated during the initial pilot selection process and the 22 months of training program. The evaluation was made at the Space Task Group and, as Director, it was my responsibility to make the final selection. I would like to emphasize that all seven of the Mercury pilots are eligible for selection for later ballistic and orbital flights. The selection of pilots for later flights will be made on the basis of similar evaluations. These seven men constitute a pool of trained engineer test pilots who were selected initially and who have now undergone extensive training for manned space flight. All seven men will work as a team during the actual flight operations with the six remaining pilots manning technical support and communications positions.

Are there any other questions?

If not, thank you very much

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D. C.

PRESS CONFERENCE

PROJECT MERCURY ASTRONAUTS

Cape Canaveral, Florida
22 February 1961

PRESENT:

JOHN POWERS, representing NASA Space Task Group, presiding.

MALCOLM S. CARPENTER, Mercury Astronaut.

LeROY G. COOPER, JR., Mercury Astronaut.

JOHN H. GLENN, JR., Mercury Astronaut.

WALTER M. SCHIRRA, Mercury Astronaut.

ALAN B. SHEPARD, Mercury Astronaut.

DONALD K. SLAYTON, Mercury Astronaut.

(Tape Recording)

MR. POWERS: Ladies and gentlemen: I am John Powers, representing the National Aeronautics and Space Administration Space Task Group.

This meeting has been arranged so that six of the seven Mercury Astronauts could be made available to the news media in such a manner as to cause a minimum of interference with our technical program. In that regard, I think it is important to know that we had to reschedule some technical work in order to make this meeting possible. It has been arranged with an effort to make them available to the most people at the same time as a convenience to you.

As all of you know, yesterday Mr. Robert Gilruth, the Director of the Space Task Group, announced that three of the seven Astronauts had been selected to begin specialized work with the spacecraft and with the people who would be involved in the initial manned Mercury flights. In making the selection, Mr. Gilruth emphasized that at that time all seven of the Astronauts are still in the program; they are eligible for possible selection for later manned ballistic and orbital flights. None of the men has been eliminated from the program.

During the initial manned flights, the pilot who will fly the mission will be supported by the other six, who will maintain communications and technical support positions.

In anticipation of your question: Because of the research nature of the program, it is not possible to forecast specifically when the first manned flight is going to be flown.

For your identification purposes, it may or may not be necessary, but from your left to right: L. Gordon Cooper; Donald K. Slayton; John H. Glenn; Alan B. Shepard; M. Scott Carpenter; and Walter M. Schirra.

Without any further word, we stand open to your questions.

QUESTION: When were you first told that the field had been narrowed from seven to three, Mr. Glenn, or Mr. Shepard?

GLENN: We knew just shortly before the announcement concerning it. I don't think we need to pin a date now to it. We knew shortly before the announcement.

QUESTION: Did you know that this selection was coming up?

GLENN: Yes, certainly. Sometime in the program it had to narrow down some. We have been looking forward to this narrowing down for some time.

QUESTION: Did this come up in recent weeks, this selection?

GLENN: I don't follow you.

QUESTION: In other words, did you know that this selection board had been actively considering you for the last few weeks?

POWERS: The specific answer is that the selection process has been under way for 22 months. We have been watching and evaluating medical and technical information all during that period. Obviously, this work has become more concentrated during recent weeks.

QUESTION: In what fashion and by whom were you told of this selection?

SHEPARD: We were told as a group of seven by Mr. Bob Gilruth, Director of the Project Mercury. He is the one who is responsible for making the decision.

SHEPARD: We were told as a group of seven, all at the same time.

QUESTION: When did this take place? Mr. Grissom has been in Bermuda.

POWERS: He was out there only a very few days.

QUESTION: You knew about it before then -- a couple of days before the announcement?

SHEPARD: He knew about it before he went to Bermuda, yes.

QUESTION: What will the specialized training consist of? Can you give us a rundown on what these three men will go through in the next few weeks?

GLENN: Naturally, with shots coming up, we will be working more closely with the equipment that we are going to use. There are a lot of particular things, like one model car to another. Different capsules have different characteristics, just as different cars do. So we will be following the equipment very closely. We will be doing last-minute work with the engineers on the Project, so that we are thoroughly briefed and fully updated on any changes that may have occurred in the capsules or the systems. We will be working closely with the booster people to make sure we have all those characteristics.

We will just be doing more intense work on the whole Project, more intense work than we have been doing all along, becoming completely familiar and completely updated with all phases of the Project, really. You can't single out any one phase and say that it is suddenly going to receive all the attention from here on in. It is just a general increase in activity across the board.

MR. POWERS: I think, if I may add to that, you might ask one of the other four what their specific responsibilities are, because they are still operating as a team of seven, and they have specific functions to perform in the flights as well.

POWERS: Deke, suppose you start it. Would you comment on what you did yesterday?

SLAYTON: I was in the control center, which I think most of you have been in at one time or another, and saw the operation there, the physical layout. I don't know what they call the capsule communicator spot, which it was our original idea to have occupied by an Astronaut. Basically, the job on manned flight here is to be in communication with the Astronaut in the capsule throughout the flight, or as long as possible at least, within communications range. On unmanned flights, of course, we are just filling the position and getting accustomed to the normal checks necessary to this position.

POWERS: Gordon, you and Scott have held down these spots. How about the blockhouse?

COOPER: The man in blockhouse would be the communications man with the man in the capsule prior to liftoff. He will be the man who switches the Astronaut in the capsule on whatever communications channel he desires to be on, in communication with both the control center, people working around the gantry, and people in the blockhouse. At lift-off, then, his function shifts over to the Astronaut in the Mercury control center.

POWERS: Another of the interesting things that we will be doing, we did yesterday. We flew chase on the flight of the MA-2 spacecraft in an F-106, and the pilot of that airplane was Walter Schirra.

Walter, could you tell us what you saw?

SCHIRRA: Probably the most impressive sight you will ever see, I think. Not many people look down at a missile coming up at them. We have had a lot of work done on getting this flight prepared to get in the proper position if the booster came through so we could be at the most critical altitude, which would be about 34,000 feet. We timed the flight to arrive at about 34,000 feet, to get a good look at it at that point, and follow it up through its flight as far as we could. We did manage to see the booster all the way through what we call "beco", where the booster engines were cut off, and about two or three seconds longer than that.

I might add in addition that Don Slayton made a chase flight on the MR-1 and MR-2 shots. I make it on this shot. We are rotating, each of us, through these different shots, just as we are through the capsule communicator spot in the blockhouse, so that we can all get checked out in the various seats that we are working with.

QUESTION: What did you see?

SCHIRRA: I saw a bodacious booster coming by that would go a lot faster than the one that the 106 people built.

QUESTION: Did you see separation?

SCHIRRA: We saw the booster section actually separate. The angle, even then, as I mentioned, we were about 34,000 or 35,000 feet. The separation of the booster was quite a bit higher and about fifty miles down range. This is not the capsule separation I am talking about but the booster engine separation. The capsule separation is quite a bit farther than we can see.

QUESTION: Did you see the escape tower go?

SCHIRRA: No. That, too, is about eighty miles down range.

QUESTION: What did it look like when it separated?

SCHIRRA: We could merely see the booster engine section of the Atlas slide off toward the rear, and shortly after that we could see the sustainer engine itself burning.

QUESTION: Exactly what are you trying to accomplish through this chase flight?

SCHIRRA: Well, for one thing, if anything did go wrong, as you undoubtedly know, we are anxious about this particular shot; this is a very important shot to us. Any coverage that we can get, such as visual, immediate, real-time coverage, is something that is worthwhile. We have practiced with these flights and we thought we could see a lot more from an airplane at a co-altitude with the booster than we could get much later on film.

QUESTION: You made no attempt to photograph it?

SCHIRRA: Yes, we had a camera with us.

QUESTION: Did you get to use it?

SCHIRRA: We haven't seen the pictures yet.

QUESTION: Had you gotten pictures before?

SCHIRRA: No, we had not.

QUESTION: This is the first time you used the camera?

SHEPARD: Yes. It is the first time anybody chased a missile, too. We have been developing new techniques here.

QUESTION: You used the F-106 on the MR flight?

SCHIRRA: That is correct.

QUESTION: You mean in the Program as a program? It is the first time we have used aircraft to chase a large rocket like this?

SCHIRRA: Our problem is that we can't fit too big a camera in back here. It must be hand-held. I think many people in this room can sympathize with our problem.

POWERS: One of the interesting things that has taken place in recent weeks in our program has been the simulation of actual flights. I was in the control center last week when a fellow by the name of Scott Carpenter was sitting at the communicator position and we actually flew a full Redstone mission simulation, just as if it were manned, and I know I, for one, was almost completely carried away with the reality of the simulation.

Scott, I wonder if you would like to talk about that a little bit.

CARPENTER: What it amounts to is manning the blockhouse, manning the control center, and having one of the Astronauts in the trainer, which itself can simulate the entire Redstone mission. Tie all of these together and everybody gets practice at his particular position in a simulated launch. We can simulate any type of failure that is possible. We go through the entire count from T minus 3 hours on down to about recovery time. Each person is given a number of failures that have to do with his own equipment by the not too kind simulation people.

POWERS: I might inject here an important point: Mr. Walt Williams, our OPS Director, and Mr. Chris Craft, our flight director, get their heads together and decide which kinds of missions and which kinds of failures might be critical down the road. They merely give an instruction to the simulation people that they want to fly these kinds of missions. Then the simulation people put this thing together, but they never tell anybody what they put in it. So whatever occurs is a complete surprise.

QUESTION: Was this the only fully simulated flight that has been flown?

CARPENTER: No, we do two or three a day. It depends on how well people do it. If many mistakes are made, then we have to stop and hash them out. If things go pretty smoothly, then we can start right in with another lot.

QUESTION: Do you do two or three a day with the full Mercury control?

CARPENTER: When possible. Sometimes the mistakes require so much discussion we can't go into another one. And we discover new things, you know, that we haven't thought of before. So it is not only training but it is research as well. And we plan to do this quite frequently on a regular basis until the launch.

QUESTION: How does this compare with the Link trainer?

CARPENTER: They are not even in the same ball park.

COOPER: Soft. It is the fanciest Link trainer you have ever seen.

QUESTION: Have you run any Atlas simulators?

SLAYTON: I might answer that one, to clarify this. Yes, we have run simulations of every mission we have run prior to the mission. This case of the one we launched yesterday, where I was in the control center, we had run simulations on this some two months ago. We then picked up again last week and ran simulations for two days last week, plus simulations on X minus one day.

Oh, yes, each mission is well-simulated prior to ever firing.

QUESTION: Would you take the actual data from yesterday's flight and feed it into a program?

SLAYTON: Certainly. We have the actual data from the mission which we can rerun through the computers, if we desire.

QUESTION: I want to ask Al and John whether they feel that they would like to ride in the next Redstone flight, whether they feel that the program is so far along that they could ride in the next Redstone?

SCHIRRA: If we don't want to, we will.

(Laughter.)

SHEPARD: What can you say after that?

SHEPARD. I think the answer is Yes; an overwhelming Yes; a resounding Yes. There are a couple of odds and ends that happened on the last Redstone flight that we want to consider more thoroughly before we make the decision to go.

POWERS: Howard, make sure you understand what his answer is. He is answering your question about whether he wants to go in the next Redstone.

SHEPARD: That pretty well covers it. I think that the main deficiencies of the last flight have been fairly well spelled out for you in recent conferences and statements. Those are the items that we are discussing at the moment.

QUESTION: As to the communicator, is it actually that this man has been tied in or linked with the man in the capsule in flight?

POWERS: He is the voice link.

Is that right, Scott?

CARPENTER: That is right. A number of people can hear him, but as it is set up now, under normal circumstances the only one who will talk to him is the capsule communicator.

QUESTION: Then one part of this esprit de corps, this "buddy" system, is suddenly a group idea, is it?

CARPENTER: No, it is just that this man, who has a good feel for the astronaut's problem, and has spent a lot of time training in the control center, is the best person to coordinate the activities of both.

QUESTION: This is interchangeable; that is what I am getting at, so far as whoever occupies the capsule communicator at any period of flight.

POWERS: From the management point of view, I think it should be obvious that it is more effective to have one of the men who has been in training with you for two years and knows the answers and has done the same work and speaks the same language doing the voice communicating.

QUESTION: Mr. Shepard, you remarked that you knew generally about the deficiences of the previous MR flights. I wonder if there is any one of these deficiencies that is of particular concern to you in getting ready for manned flight?

SHEPARD: Yes, I think all of the deficiences are of concern to us because we fire these things to find out if everything has been properly planned and if everything is going to work properly. And if you find out that something goes wrong in a system, you are certainly concerned about trying to put your finger on the trouble and to get it corrected. I don't think that we are overlooking anything at all. We are giving all of the problems equal consideration.

QUESTION: I would also like to hear Glenn's comments on weather he would like to go in next Redstone?

GLENN : Absolutely.

(Laughter.)

My answer would be the same as Al's on this. Of course, we are looking at things that have occurred in the past that we want to see corrected and that are being corrected. But, of course, we are ready to go. The capsule is ready and we are, too.

QUESTION: Are you very much concerned with the fact that the last MR went quite a way over in the program -- 120 miles, I believe -- in that area? Are you concerned that you might be somewhere in the Atlantic floating down there 120 miles away?

GLENN : This is one that was pretty well spelled out, I believe, in the releases after the last shot, that there was an over-speed and that there was a little more thrust than had been planned for, a little faster burning, and this resulted in the over-speed. Even though the thing was over-speeding, though, and didn't follow the exact trajectory that was planned, the whole thing was back on board the ship in -- what was it; 42 minutes from launch, back on deck?

POWERS : Not on the MR-2. About three hours.

GLENN: Oh, yes, MR-2; three hours.

SHEPARD: About 45 minutes.

QUESTION: You will come out of the capsule into a little life raft anyway, won't you, as far as that is concerned?

GLENN: Not necessarily.

QUESTION: You will remain inside the capsule?

GLENN: Normal procedure will be, probably, to remain inside, if all is going well. You have the option, however, if you desire, to get out in the raft.

QUESTION: Will they give you an apple to eat while you wait?

SHEPARD: Ham didn't have the opportunity to get out in the raft. Not the apple. He didn't have the opportunity to get out in the raft. That wasn't his prerogative.

QUESTION: Colonel Glenn, could you recreate, when you got the news, how you told your wife and what was her reaction? Where were you and what happened?

GLENN: I would rather not get into places and times, and such things as that. She was very happy with the announcement, as I was, of course, too. I think the statement that was released on it yesterday -- we have been looking forward, of course, to the selection for a long time.

I would like to reiterate the one thing that Al said a little while ago: We don't look at this selection as culling out one group here and another group does something else and that the group is all split up now. We are considering this still as a real team effort, a group of seven. That is the way we have operated all along, and that is the way we continue to operate.

To get back to the wife's thing, I don't know what else to say except that she was very happy about the selection and shares my feelings about it completely.

QUESTION: Might I ask Mr. Carpenter: What was your initial reaction? Were you personally disappointed?

CARPENTER: In a way. But I also am aware of the fact that there are other flights left, and I plan to be on one of them.

QUESTION: How does that go for the other four who were not chosen?

COOPER: I think that sums it up very well. I think we have said all along that the important thing is not to be first on a particular shot, but the overall mission that we are doing, which is not just a fly-by-night attempt but a long-range goal. I think there will be a lot of birds and a lot of flights in the long run.

QUESTION: The ultimate goal is the Atlas orbit shot. This does not necessarily mean Astronauts Glenn, Shepard, and Grissom will be selected for this flight. It will be a selection process all over again.

POWERS: As we indicated yesterday, Mr. Gilruth did we have more manned flights down the road. As we come up on those flights we will run essentially the same kind of an evaluation that we ran for the selection for the initial flights. All seven men are still eligible. We have a long program going..

QUESTION: I think there has been some confusion somewhere along the line, some rumors kicked about. At one time there was a rumor that the first man to go on the Redstone would be amongst these two or three, and the succeeding Redstone shots one man would be chosen from backup group of four. Is that true?

POWERS: I think the best answer to that is that we have chosen three men for the initial flights. By "initial flights" I think the best estimate I could give you is probably at least two.

QUESTION: There has to be more than one?

POWERS: Obviously there has to be more than one. More than one and less than three.

The point I am trying to get at here is the fact that we have selected this group of three does not foreclose the opportunity for the other four to fly later flights.

QUESTION: Can you be a little more specific about how the selection was made? The statement given to us yesterday that it was based on 22 months of information. Are there some criteria that were met?

QUESTION: Are there some criteria that were met in selecting the three men?

POWERS : I think the best answer I can give you to that is that first of all the initial selection process was probably one of the most vigorous selection processes that has ever been conducted any time with regard to selecting people. Since that time we have been in vigorous training for some 22 or 23 months.

SHEPARD : We are trying to establish whether the process was successful.

POWERS: In every training situation we acquired medical information. For example, one of the things that these gentlemen have that I don't have is four tattoo marks, one on the upper and lower breastbone in the front, and one under the rib cage on each side. The reason for that is so that we can attach medical instrumentation to exactly the same point on the body. We have been doing this now throughout all of the centrifuge rides, the pressure chamber runs, and all of the other training activities, and we have been, therefore, acquiring more and more and more medical information on their own physiological reaction to these situations.

In addition, we have been running training in the procedures trainer; that is, actually simulating missions. We crank in problems in the cockpit, systems failures; we run time studies on how fast they react to these kinds of things. I think the best thing that I could say is that the people we selected right now are those that currently appear to be the best qualified for this particular mission. That could change, and this is the reason we keep saying that we have not foreclosed on the other four.

QUESTION: You are saying in effect that it may be something like a football team, where some people are started in the early part of the season and others come along later?

POWERS : I think perhaps this is reasonable.

CARPENTER: That is a real good answer.

(Laughter.)

GLENN: Maybe this selection is a midpoint between Ham and humans too.

(Laughter.)

QUESTION: Which one of the fellows has the longest arms?

POWERS: The way we are going to choose the pilot is to see who fits that sweater I got the other day.

QUESTION: Or if they take apples or bananas.

QUESTION: Will most of this intensive training be done right here at Cape Canaveral?

POWERS: I suspect a good bit of it.

GLENN: There will be a lot of activity here. There will be activity at Langley. This isn't going to be pinpointed at any one spot, as I indicated earlier. It is just a general step-up in activity and intensification across the board. There won't be any one phase of it in particular that will receive the emphasis. Obviously, as time goes on, we are going to be spending more and more time here at the Cape, as we have been for the past year. We have gradually stepped up our activities here, and I am sure this will continue.

QUESTION: Will this involve more centrifuge tests, things like that?

GLENN: This hasn't been set up at the moment, no. We may go back to Johnsville occasionally for refresher work on it, but there is nothing programmed as of this moment.

QUESTION: I would like to ask: With three very good successes under your belt now, I would like to ask the Astronauts: It is very evident that the program is moving along very well; do the Astronauts feel that we have a good chance of beating the Russians into space with a missile try? Any chance? A good chance?

CARPENTER: I think it is pretty obvious that they have greater capability in some fields that are involved in orbital flight, particularly in weight-lifting capability. We know they have a pretty advanced environmental control system to sustain their animals in flight.

A direct answer -- this is just my personal feeling -- is that I will be surprised if they don't beat us to orbiting a man.

QUESTION: Gilruth said yesterday that a notification would be given shortly before the flight to the one who was picked. Would you like to be notified, if you are the one, far in advance?

SHEPARD: At least before sunrise on launch day.

(Laughter.)

QUESTION: Would you prefer to know now, or a month ahead, say, rather than a day or so ahead.

SHEPARD: Well, that is a kind of a tough one to answer. I think all three of us are interested now more in the hardware, because we have been, as John indicated, training over the past months on devices that were away from Canaveral and that dealt with one specific stress area, one specific training area. Now we are getting down to the point where we are dealing with hardware. So I don't know exactly how long before the flights you would really want to know. Maybe a week or two weeks. But certainly not immediately before.

QUESTION: Have you had any indication, Mr. Shepard, when you will know, from the official view?

SHEPARD: The date on which the pilot will be named has not officially been decided.

I think the concern here is more in getting familiar with the mechanical systems on board, with the range support, with the various things that are available here at Canaveral during the flight, more than it is any kind of mental conditioning. I think all seven of us have been conditioning ourselves mentally now for almost two years, as have the wives.

QUESTION: Being a test pilot, you don't have a psychological block.

SHEPARD: It is too bad I don't have a hedge shrinker here to answer the question. But no one is qualified to talk about himself.

QUESTION: As I understand it, in Project Mercury it is possible for a man to go along just for the ride. Of course, you have demonstrated that in unmanned shots, that the capsule will fly and without human control, other than getting it from the ground.

However, in the chimpanzee shot it was necessary to subject the chimp to psychomotor testing to see how he responded. In this upcoming shot you will have, of course, the automatic equipment, the ground control equipment, and the equipment which you can activate yourself. At this point have you got any plans for putting the Astronaut himself through something similar to the psychomotor testing that the chimpanzee would have to perform?

GLENN: Actually, our whole planned activity for flight, of course, is very well drawn out. We have a plan for what we will do. This in effect is our psychomotor testing, to know whether we go through these, do the adtivities that we plan to do at the stated time periods of boost, high G, zero G, reentry, and we have activities, of course, planned for each of these areas. This is our psychomotor, more or less, if you want to make an analogy.

QUESTION: Do you have any mild shocks if you fall behind?

GLENN: What?

QUESTION: Will you have any mild shock --

SHEPARD: Hell yes. We still have adrenal glands. I imagine so.

QUESTION: Do you mean to indicate that in this upcoming shot that the first responsibility will be the Astronaut's, and if he fails to do his job that the automatic and remotely controlled equipment will take over?

GLENN: Yes. This has been the way Mercury has been set up all the way through, and that is the reason for all the automatic systems, really.

What we are trying to do, of course, is to put a man up here and let him operate and determine what his capabilities are or are not in space. But at the same time we don't want his survival to depend on whether he can or can not do these things. If he finds that he cannot work something in a certain field because of prolonged weightlessness, then we want an automatic system that does this for him. So that the whole program has been set up as an automatic system which can take over in case the man fails.

This, of course, feeds into the future design of future vehicles, future vehicles where we hope to have power capability and decision-making capability to go where we want to go in space. This is really what we are trying to start here. We could put a man up in this and fire him and actually you haven't accomplished anything unless you apply your knowledge to something in the future. This is the case in any field. We are taking one stepping stone at a time to where man's decision-making capability in space is mandatory and is not just an excess being taken along.

QUESTION: Then in effect the Astronaut in the space capsule will be actually the pilot who will have safety equipment to back him up? I mean, he is not to be just a passenger by any means.

GLENN: Oh, no. No, not at all. In fact, we are having trouble finding enough seconds to get everything in that we want to get in, of course.

QUESTION: Then in these early flights everything will be automatic and you have the over-ride capability, as opposed to possible later ones where you are fully on your own?

SHEPARD: I would like to make a remark about the chimp before you drop that. You talked about the psychomotor thing. Tweaking the chimp with an electric shock, all of this is to get the chimp motivated to do something. First off, the fact that you are putting a man in the capsule where he wants to use this vehicle to further his knowledge and man's knowledge is the motivation that you give to the chimp by electric shock. Man has something to do in this vehicle and we have already scheduled a number of chores to do as we go through the flight.

John mentioned the point that you run out of seconds to do these things. We have many things we need to do. The Redstone flight isn't long enough to do all the things we want to do; therefore, we must orbit to find out what man's capability is.

SHEPARD: To give you a specific answer to your question: the first manned Redstone flight has some functions programmed for automatic execution, and some functions programmed for manual execution. We already know which ones we are going to do automatically and manually at the moment, assuming everything goes as planned.

In the next Redstone flight these functions would be reversed, so that the man would take over where the automatic systems had performed in the first Redstone flight, and the functions the man had performed in the first Redstone would be taken care of by the automatic systems in the second.

QUESTION: Can you be more specific about which functions will be the man's responsibility?

SHEPARD: I would rather not, but I will give you an example. Suppose the capsule leaves the pad with the pointed end headed up, and after it separates at the end of the powered flight, after it separates from the booster it turns around, blunt end first. The turn-around in the middle, for example, on one flight would be scheduled automatically, using the autopilot on board the capsule. The next flight we might schedule that for the man to do the same thing. That is just an example.

There are several of these functions during the flight which can be interchanged between the automatic and the manual systems. Of course, on all the flights the man on board will be reacting and giving quantitative and qualitative impressions of his ability to move the controls, his ability to read the instruments, his ability to look out, just his general feelings. This will be true of all flights. And his like or dislike of bananas.

QUESTION: Will the Astronaut in the first flight have the opportunity to see who will be manning the flight controls. Will he have that opportunity?

POWERS: I don't think it is as clean as that, or as specific and definitive as that.

The training process, the interchange of people through these positions has been going on for some time and will continue. Certainly I think you will have an input into the decision.

SHEPARD: If I may be hypothetical, assume that I had the opportunity of going. Of the six remaining at that point, the performance of all six has been of such equal stature that it wouldn't really make any difference.

QUESTION: It wouldn't make any difference to you?

POWERS: That is a good point.

QUESTION: Will Mr. Gilruth make the final decision on which one will make the first flight?

POWERS: Yes.

QUESTION: Colonel Glenn stated previously that each capsule is different, and they handle differently. Could you elaborate?

GLENN: I thought after I said that that perhaps this might have given the wrong impression.

QUESTION: I don't suppose the capsules are totally identical.

GLENN: These are very intricate electrical and mechanical systems, of course, in the capsule. It is like people who work with computers, who tell us that they almost have personalities when they get that complicated. They know what little idiosyncrasies each computer has, and where it is liable to give trouble, its history of trouble in a certain system, and it has been very reliable in another system. It is this sort of thing that I was talking about, rather than there being different construction techniques or different things like that.

QUESTION: I was wondering in which way they might be different.

SHEPARD: We have been modifying and improving, too. For example, the capsules we have now were ordered some time ago, you can imagine, and things we have found in production and testing, improvements that we can make in later capsules, have been incorporated in those that are being built in St. Louis. So it is a question of continual improvements.

SHEPARD: The autopilot is one example. The autopilot which controls these capsules is slightly different than the ones which are coming out later on.

GLENN: I can think of one example here that carries over from airplane driving days, and that is on control force, the force that you need on the control stick, on the hand controller; in this case, to move it to certain positions.

In airplanes you can fly in one airplane of a model and fly in another airplane of a model and you may have a little different feel to the stick; why, you don't know. It is just that someplace somebody tightened up a screw, a bolt, or a control link a little tighter than they did on the other model coming along durther down the line.

SHEPARD: Or there may be a mouse inside.

(Laughter.)

GLENN: We have the same type differences on capsules here.

QUESTION: What are you going to do on that long trip?

GLENN: We are referring to this record of Jose Jimanez. Have you heard that? The one on the Astronaut.

(Laughter.)

QUESTION: When is Mr. Grissom coming back?

POWERS: That is kind of hard to say. We have an airline strike on, as you know, and it is a little bit difficult to move anyplace these days.

QUESTION: Was he still in Bermuda this morning?

POWERS: Yes, he is.

QUESTION: Have you talked to him?

POWERS: I talked to him yesterday, about noon or one o'clock; thereabouts.

QUESTION: Did he have anything to say about the selection?

POWERS: No.

SHEPARD: He didn't disagree.

(Laughter.)

SHEPARD: He had no complaints.

QUESTION: Did he have any comment on yesterday's shot?

POWERS: It was a little early for him to make any kind of a definitive comment. We exercised the Bermuda tracking station, I think is all that we know, in connection with the MA-2 shot. We were very pleased with the results of our exercise.

Gus occupied the capsule communicator position out at the Bermuda site, the same as Deke was occupying it here. We were checking out our communications lines, our procedures for cross-handing missions and this sort of thing. It was, I think, quite successful.

QUESTION: Astronaut Glenn, in your limited visits with the Astronauts during the training program, I have noticed each time that while visiting the simulator for the Redstone that Astronaut Grissom was making the simulation. Why? Does this necessarily mean that he was making more simulations than either of you two?

GLENN: No, I don't think so. I think our time spent on the simulator was about equal. We are all fairly close on the same number of missions. I think this has been a circumstance more than anything else. Had you visited at a different time period you would have found Wally in it, or Deke, or various ones of us at different times. During the simulations out here a week or so ago I was in the procedures trainer out here for several of the simulations.

We will have more checks coming up in which someone else will be here for several days doing simulation. So there is nothing pinned down on that at all.

QUESTION: There was a lot made to do about the last-minute selection of Subject No. 65, when actually the selection, I understand, was made several months before. It was just a case of qualifying at the last minute to make sure that he was still in condition.

QUESTION: Could there be such a thing as a tentative selection among the four remaining Astronauts?

. POWERS: In response to the first part of your question, I personally asked Dr. Moseley the day before the flight if he had selected the subjects, and he answered me No, that we will select him tomorrow.

If he, or some of the other people in the program, had made their own conclusions in their own mind before that time, I don't know about it.

As far as a man is concerned, I think that during this current time phase certainly Mr. Bob Gilruth and Mr. Williams and the members of our OPS staff, our technical crew, will be thinking about this. I think the same kind of a process may well prevail. It is an evolutionary process where, day by day and week by week, they are impressed with this or that and it is another straw in the pile toward a decision.

QUESTION: Do you think that they have it in their mind now more or less that one of the three was dominating?

. POWERS: I don't think it is as definitive as that, Jay. I do think that certainly they wouldn't have chosen these three if they had not had an inclination toward these three over the long-time stretch. And I think that you can say that the same thing prevails right now.

QUESTION: But has any one of these three been informed, or have all three been informed, that perhaps there is one individual who has a better chance at this time than any of the others?

SHEPARD We are all looking over our shoulders.

(Laughter.)

POWERS: What I have been getting is a lot of trouble. They have been accusing me of trying to get in line, and then butt their line. I just can't seem to get any satisfaction out of this.

QUESTION: I understand that you are doing lend-lease to England with Air Force trials.

POWERS: I hadn't heard. But I am ready.

(Laughter.)

QUESTION: I just wonder if all seven of the Astronauts have access to the data that is accumulated on them as individuals during the testing and training, or is this material kept from them and kept in the hands of a selection group?

POWERS: I think it is available.

SHEPARD Yes, we have questions about our own individual reactions, certainly. I think all of us are interested in how we reacted as individuals, not necessarily from the standpoint of finding out how others did on a specific test. And any time we have any questions on ourselves, the data is always available to us.

SHEPARD I was going to make the remark that very few psychologists will let you get to their data, presumably because they don't want you to work with it. They don't want you to confuse yourself.

QUESTION: But the rest of the data, you would be able to get that?

SHEPARD Yes.

POWERS: Any other questions?

QUESTION: I have just one. I would like to know how the children reacted. They asked about the wives. I think the children would be more excited than anybody.

SHEPARD: I think reactions here are not instantaneous. I think everybody seems to indicate that the fact that they decided on narrowing the group from seven to three for the first flights is a big shock to everybody, everybody saying "Gosh, how does everybody react? Any big change in plans?"

This isn't really the case. All seven of the families, I am sure, were involved in the program since April 1959, 22 months ago, approximately. It has been a gradual process. So there isn't anything like "Daddy is going to go," or that sort of thing. They have known all along that Daddy was being considered, for example.

GLENN: I think probably the impact in April 1959, with the selection at that time with a larger group, possibly the impact on families was greater then than it is now because of this more or less educational program or building up program that the whole famlies or groups have done together.

POWERS: In conclusion, there is a point that I would like to make.

As all of you know, there is a tremendous amount of news media interest in our program and in these people. I think if you thought about it a few minutes you would readily understand and realize that it is not physically possible to conduct this program and respond specifically to all the things that the various news media are asking us to do. There is just 24 hours in each day and seven days in each calendar week.

We will attempt, during this program, to keep you informed, to make whatever arrangements are physically possible, but we don't feel that we can interfere with the progress of the program for this purpose. So we solicit your understanding and your assistance.

(End of tape recording.)

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Pur.

NEWS RELEASE

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RELEASE NO. 61-37

FOR RELEASE: IMMEDIATE
February 28, 1961

DR. ROADMAN NAMED DEPUTY DIRECTOR OF LIFE SCIENCES

Col. Charles H. Roadman, a special assistant to the director of the Office of Life Sciences since June 15, 1960, has been appointed deputy director of that office.

Dr. Roadman, 46, a career Air Force officer, is an aviation medicine specialist. He entered the Army Air Corps in 1940 and is rated as a command pilot (jet qualified) and chief flight surgeon. Dr. Roadman is a graduate of the Northwestern University School of Aviation Medicine and the Air Force School of Aviation Medicine.

Dr. Roadman and his family live at 4312 Thirty-seventh road North Arlington, Va.

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